# Farm Management Handbook

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# FOREWORD

It gives me considerable pleasure to write a foreword for this Farm Management Handbook. Pakistan has always had much information about agriculture, but often scattered and not easily accessible. A handbook such as this will serve as a very useful guide and hopefully will be used by the academic community, students, farmers and other people working for Pakistani agriculture. The spreadsheets provided for various farm enterprises can readily be applied to many different economic conditions of our country.

Dr. Bashir Ahmad, Dr. Zakir Hussain Rana and Dr. Jim Longmire have put in great deal of dedicated work on the preparation of this document for which they deserve to be complimented.

Dr. Muhammad Rafiq Khan
Vice Chancellor
University of Agriculture
Faisalabad.

August, 1993

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# INTRODUCTION

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## Background

Farm management data and information related to the performance of a cropping or livestock production system in the form of input-output ratios, costs, returns and profitability are needed by a wide variety of users. This group includes policy planners, advisors and extension agents, researchers, teachers, students, credit and input supply agencies and farmers. The policy planner, for instance, has to take into account the likely farm level impact of a new policy or a proposed adjustment to an existing one. Similarly, researchers and extension agents engaged in Farming System Research (FSR) work and studies depend on the farm management type of information for several purposes such as: (a) evaluation of interventions to the existing systems of production; (b) identification of the potential for financially rewarding innovations; (c) ordering of research priorities as well as exploration of further avenues for development; and, (d) comparison of the economic performance of alternative cropping and livestock systems.

In a country like Pakistan, farm management data for agricultural enterprises are not readily available under a single cover. Numerous farm-level or farming systems studies do exist and their usefulness is undeniable. However, the data from these studies are rarely compatible and many of the studies remain inaccessible to those interested. Despite the fine work done on farm-level and enterprise economics much needs to be done to strengthen them.

Over the last several years, University of Agriculture, Faisalabad (UAF); the Pakistan Agricultural Research Council (PARC) in collaboration with International Maize and Wheat Improvement Centre (CIMMYT) and Punjab Economic Research Institute (PERI) have accumulated a unique data set on the technical and other aspects, at least, of major cropping systems through collaborative investigations and surveys in Pakistan. This data base, when supplemented with other established sources provided an excellent opportunity to create a Handbook on Farm Management for the first time in Pakistan.

## Some Basic Concepts

The users of this Handbook are expected to have minimal familiarity with the concepts of farm management. An appreciation of the distinction between the variable and fixed costs and the idea of gross margin should be a logical starting point. However, to refresh memories, an explanation of these concepts is provided. Let us start with costs.

In estimating the returns from an agricultural enterprise or a production system, an important distinction is drawn between variable and fixed cost. The **Variable Costs** are those costs which are specific to an enterprise and vary with its scale. Another way of appreciating the significance of this definition is that variable costs should be completely attributable to the presence of an enterprise on the farm. For instance, production of wheat in a cotton-based cropping system of Punjab, cost items such as seed, fertilizer, manure applied, tubewell water used, etc. make up variable costs since they are paid only if wheat is grown. Normally variable costs increase with the intensity of inputs for a particular enterprise.

The **Fixed Costs** on the other hand are the cost items which can not be assigned directly to the operation of an enterprise; that is, they must be defrayed whether a particular enterprise is operated or not for the current production cycle. Whatever the scale or intensity of a particular enterprise, fixed costs do not vary. For wheat production, such items are: some family labor and land rent which must be paid irrespective of the presence of wheat in the current farm plan. On a farm where several enterprises are in operation, it is very difficult to allocate fixed costs between enterprises.

The market value of the produce (and that of any by-product) of a production system is defined as its output: Normally this value is based on prices at the farm (village prices adjusted for local transport costs). When the variable costs are subtracted from the estimate of the output, the remainder is called the **Gross Margin**. This difference between the output and the variable costs, usually calculated on per acre or per hectare basis, is a very useful measure of the performance of an enterprise and the contribution that it can make to farm income or profitability.

The concept of gross margin is simple and easy to understand and can be used in many ways. It should, however, be pointed out that on its own **gross margin** is not a profit measure, it is simply an estimate of the potential contribution that an individual enterprise can make to farm profit. The gross margins do vary from farm to farm due to varying influence of factors, like soil fertility, climate, market conditions, prices and the difference in farming practices. These factors also cause variation in gross margins from year to year on a farm and between farms. It is therefore, wise that in-so-far possible, in using gross margins, the variations in such factors, particularly prices and techniques of production should be taken into account.

In this Handbook, however, the data and information used for various enterprises reflect typical circumstances with regard to the techniques of production and prices that prevail currently in Pakistan-Punjab. To simplify the

budgets, prices, yields and other key assumptions are based on 1992-93 values. Farm operations such as ploughing, planking, etc. have been costed out if carried out mechanically, notwithstanding the fact, that on many small farms bullocks may still be an important source of draught power. The reason for costing this way is that the bulk of land preparation in Pakistan is now mechanical, so costs of tractor operations set the market rates.

The idea explained so far can be illustrated by considering the example of wheat grown in the Cotton Zone. The complete set of calculations, both on a per acre/hectare basis is given in the table entitled WHEAT IN COTTON-BASED CROPPING SYSTEM.

The Output is worked out as :

| | | |
|---|---|---|
| Grain 21 Maunds (40 kg.) | @ Rs. 130 | = 2700.00 |
| Straw 42 Maunds (40 kg.) | @ Rs. 12 | = 504.00 |
| | | Rs. 3234.00 |

The Variable Costs are dealt in two parts; first, those which are incurred up to the point of harvest:

| Operations | Unit | Price | | Total Cost |
|---|---|---|---|---|
| Rotavation | 0.1 | @ Rs. 150 | = | 15.00 |
| Ploughing | 3 | @ Rs. 50 | = | 150.00 |
| Ploughing & Planking | 2 | @ Rs. 70 | = | 140.00 |
| Seed | 40 kg | @ Rs. 4 | = | 160.00 |
| Fertilizer(s) | | | | |
| N | 42 kg. | @ Rs. 9.13 | = | 383.00 |
| P | 22 kg. | @ Rs. 8.17 | = | 180.00 |
| Manure | 35 Maunds | @ Rs. 5.00 | = | 175.00 |
| Transport | 35 Maunds | @ Rs. 0.50 | = | 18.00 |
| Irrigation | | | | |
| Tubewell | 4 Hrs. | @ Rs. 35 | = | 140.00 |
| Labor | 10 Hrs. | @ Rs. 4.5 | = | 45.00 |

These are then the variable costs which are incurred upto the point of harvest; thus, an amount of Rs. 1406 is required as working capital. In economic terms this money could have been invested to earn a return by depositing in a bank. Often, however, this working capital has to be borrowed by the farmer and interest has to be paid. In either case the interest charged is a variable cost and is worked out by multiplying the following components:

Sum of variable costs to the point of harvest
times
Rate of interest (Percent per annum/12.5%)
times
Duration of crop
(1406) (0.125/12)(6) = 87.88

The harvesting and threshing costs, often paid in kind in Pakistan (10% of crop yield each) as a rough guide are also part of the variable costs and are:

| | |
|---|---|
| Harvesting Charge | 84 kg. @ 3.25 = 273.00 |
| Threshing Charge | 84 kg. @ 3.25 = 273.00 |

The sum of all these variable costs comes to Rs. 2040.00. Now the Gross Margin can be obtained as:

| | |
|---|---|
| Output | Rs. 3234.00 |
| Variable Costs | Rs. 2040.00 |
| Gross Margin | Rs. 1194.00 |

When both variable and fixed costs are added, the cost of production for one acre of wheat is obtained as Rs. 3269. This also includes rent of land and deducting it from the output figure, the estimate for the **Net Income With Rent** is Rs. -35. Some analysts would prefer to work with an evaluation of income without rent; therefore by adding back the rent of Rs. 1150.00 to Rs. -35 the **Net Income Without Rent** becomes Rs. 1115.00

From the above information and the calculations done so far, at least three further measures of performance for this enterprise can be derived. First, without drawing any distinction between family and other type of labor, the total number of hours used in wheat production, as given in table entitled LABOR REQUIREMENTS FOR MAIN RABI CROPS (per acre) can be used to derive an estimate of **Returns to Labor** (Rs. per day). The total number of hours needed is 73 which when priced at Rs. 4.50/Hr brings the labor cost component to Rs. 328.50 and the returns to this input are estimated as:

Net Income With Rent (Rs. -35)
plus
Labor Cost component (Rs. 328.50)
divided by
Days of labor (73/8)

The return to **Working Capital** is arrived at by adding the interest charges (Rs. 87.88) to Net Income With Rent and dividing this sum by the working capital required to operate the enterprise to the point of harvest (that is, the variable costs from rotavation to irrigation plus the interest charges, which comes to Rs. 1493.88). The result is our estimate of the Percentage Return to Working Capital (% return per rupee of working capital). The actual figure of 4 % for wheat after cotton is derived as follows:

$$(-35 + 87.88)/1493 * 100 = 3.54 \text{ or } 4\ \%$$

By following a similar procedure the returns to **Investment in Land** can be estimated; that is, divide Net Income without rent by the price per acre of land (Rs. 1,00,000) and multiplied by 100; so that

**Returns to Investment on Land(%) = (1115/1,00,000)*100 = 1.12**

The calculation of **Gross Margin** and other performance indicators for livestock enterprises follow essentially the same principles as for cropping enterprises. But, there are some differences which are best illustrated by taking the example from the table entitled **SAHIWAL COW.**

In working out the **Gross Margins** for livestock enterprise, an underlying assumption is that the calculations refer to a 'steady state' enterprise; that is, a productive animal is being kept in a herd where births (including male/female calf ratio), deaths, culls and replacements are consistent with the maintenance of a certain number of productive animals in a given year. For this reason it is usually convenient to assume a herd size of 100, as the fraction derived from this number can readily be used for estimating costs and returns on a per head basis.

Referring to the **SAHIWAL COW** enterprise, it is clear that the output is derived from five elements; milk, male and female calves, heifers, culls, and manure. The proportional contributions of the two types of calves to output allow for mortalities amongst them before being sold. The culling rate of 7 % is related to replacements coming to the herd at 12 % as shown in the cost sections of the enterprise budget. Ideally, if there are no deaths or replacements then the two rates should be the same; but a higher replacement rate compensates for replacement mortality. So the output of

**SAHIWAL COW** is:

| | | |
|---|---|---|
| Milk 2250 liter | @ Rs. 4.5 | = Rs. 10125 |
| Calf 0.39 | @ Rs. 700 | = Rs. 273 |

| | | | |
|---|---|---|---|
| Heifer 0.29 | @ Rs. 2400 | = Rs. | 696 |
| Culls 0.07 | @ Rs. 6000 | = Rs. | 420 |
| Manure 160 Maunds | @ Rs. 5 | = Rs. | 800 |
| **Output** | | | Rs. 12314 |

The Variable Costs are the following:

| | | | |
|---|---|---|---|
| Fodder | | | |
| Green 420 Maunds | @ Rs. 8 | = Rs. | 3360 |
| Dry 90 Maunds | @ Rs. 12 | = Rs. | 1080 |
| Concentrate 25 Maunds | @ Rs. 100 | = Rs. | 2500 |
| Vet. & Medicine | | = Rs. | 100 |
| Bull service charge | | = Rs. | 50 |
| Replacement 12% | @ Rs. 14000 | = Rs. | 1680 |
| Interest @ 12.5% per annum on average value | | = Rs. | 1250 |
| Labor (1/2 of total required) | | = Rs. | 1440 |
| **Variable Costs** | | | Rs. 11460 |

The working capital tied up in the production of one animal is assumed to be equivalent to its average value (that is half of the sum of replacement cost and the culling price) the interest charge is 12.5 % of this sum.

Thus, the **Gross Margin** per head is (12314-11460) = Rs. 854.00

The fixed cost items include the remaining half of the labor requirements (Rs. 1440), equipment cost (Rs. 192) and interest on shed and space plus depreciation on shed (Rs. 375). The total cost of keeping a **SAHIWAL COW** is now Rs. 13467.00 making the net income per head to be Rs. -1153.00

The return to labor is calculated by the same method as for the cropping enterprises and comes to Rs. 22 per day; the remaining two measures of performance are **Returns to Feed Cost (%)** and **Returns to Livestock Capital (%)**.

The return to Feed Cost are estimated by adding back the feed costs to the Net Income and then dividing the resulting sum by the feed costs figure before multiplying by 100:

$(-1153+6940)/6940*100 = 83\ \%$

Similarly the estimate of the return to Livestock Capital is obtained by adding back the interest charge on the average value of the animal to the Net Income and dividing the sum by the average value before multiplying by 100:

$(-1153+1250)/10000*100 = 1\ \%$

As regards fruit or orchard enterprises, the situation is rather different, growing fruit trees represent long-term investment. The first few years of such enterprises only involve costs and low returns. In order to make a sensible comparison of the tree growing activities with annual enterprises like crops, a basic approach is to estimate the annual **Net Present Worth** by discounting both future costs and returns. This is what has been done and is illustrated below with reference to **KINNOW ORCHARD.**

Generally Kinnow trees do not start bearing fruit till the fifth year of their life and the annual fruit harvest is divided into two distinct yield cycles: first, from the 5th to the end of the 10th year; and the second from, 11th year to 20th year before replacement. The main difference between the two cycles is the average number of Kinnows per tree that can be harvested annually. The yield in the second cycle is more than twice as compared to the first one.

On an average 90 Kinnow trees can be planted per acre producing 350 Kinnows/tree during 5 to 10, and 750 Kinnows/tree from year 11 to 20. The Kinnows harvested sell at rupees 48/100; and this price, in common with other costs and returns, is assumed to remain constant throughout the duration of the enterprise. This is a fairly common approach to avoid the complications arising from attempts to include inflation in input and output prices. The output for this enterprise is worked out as follows:

| | | | |
|---|---|---|---|
| Year 5 to 10 | 350 Kinnows/yr/tree | @Rs. 48/100 | = Rs. 90720 |
| Year 11 to 20 | 750 Kinnows/yr/tree | @Rs. 48/100 | = Rs. 324000 |

Thus the annual output in the first cycle is Rs. 15120 and during the second cycle, it is Rs. 32400 at constant prices; the sum of the two being Rs. 414720. The Present Value equivalent of this is obtained by applying the standard discounting method as below:

$15120/(1+0.12)^5+\ldots+15120/(1+0.12)^{10}$
$+32400/(1+0.12)^{11}+\ldots+32400/(1+0.12)^{20}$
which comes to Rs. 93505.

As regards the costs, they are organized under four separate sections. the first establishment year, years 2 to 5, years 6 to 10 and years 11 to 20.

On a per year basis these costs work out to be:

| | |
|---|---|
| First year | Rs. 7058 |
| Per year-yr 2 to 5 | Rs. 7107 |
| Per year-yr 6 to 10 | Rs. 10906 |
| Per year-yr 11 to 20 | Rs. 13397 |

The present worth of these costs is estimated as follows:

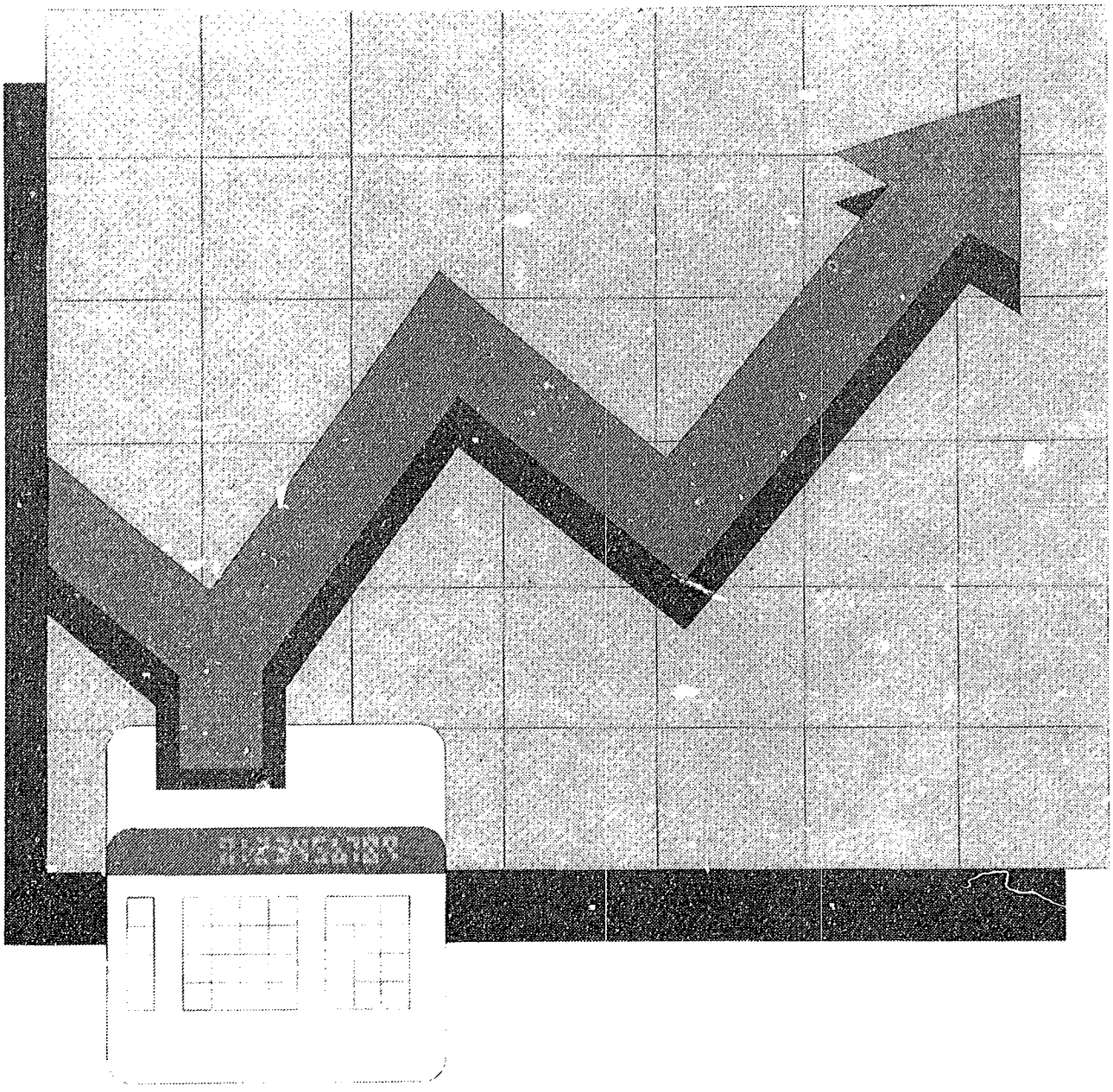
$$7058/(1+0.12)^1 + 7107/(1+0.2)^2 + \ldots + 7107/(1+0.12)^5$$
$$+$$
$$10906/(1+0.12)^6 + \ldots.. + 10906/(1+0.12)^{10}$$
$$+$$
$$13397/(1+0.12)^{11} + \ldots.. + 13397/(1+0.12)^{20}$$

which works out to be Rs. 69898, and the difference between the present worth of the output and costs is Rs. 23607 which works out to be Rs. 1180 on an annual basis.

The above explanations should be sufficient for any one to appreciate the details of gross margins that are presented in the following pages. These budgets are organized in section 2 of the Handbook under eight different sections; Food Crops, Cash Crops, Pulses and Oilseeds, Vegetables, Fruits, Fodder Crops, Livestock and Poultry. Subsequently the remaining seven sections of the Handbook deal with Enterprise Labor Requirements by Operation and Crop, Farm Machinery Costs, Recommended Practices, Water Requirements of Crops, Nutrient Content of Food Stuffs, General Farm Management Information and References.

The information required to compile a report such as this is continually changing. The enterprise budgets and underlying yields, inputs, technical coefficients and standards are of necessity, general by nature. We would advise any user of the budgets contained in the report to adapt them to their specific problem at hand. It is impossible to depict all the complexities of the farming systems and agro-ecologies in one report. We strongly encourage users to take the framework provided in this Handbook and to use up-to-date prices and other information for their economic analysis.

# Enterprise Budgets and Profitability



# WHEAT IN RICE BASED CROPPING SYSTEM

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Grain | 40 Kg | 20 | 130 | 2600 | 6422 |
| Straw | 40 Kg | 40 | 12 | 480 | 1186 |
| *Output* | | | | 3080 | 7608 |
| *Costs* | | | | | |
| Ploughing | No | 4 | 50.00 | 200 | 494 |
| Ploughing & planking | No | 2 | 70.00 | 140 | 346 |
| Seed | Kg | 40 | 4.00 | 160 | 395 |
| Fertilizer(s) | | | | | |
| N | Kg | 33 | 9.13 | 301 | 744 |
| P | Kg | 20 | 8.17 | 163 | 404 |
| Manure | 40 Kg | 15 | 5.00 | 75 | 185 |
| Transport | 40 Kg | 15 | 0.50 | 8 | 19 |
| Irrigation | | | | | |
| Tubewell | Hr | 4 | 35.00 | 140 | 346 |
| Labor | Hr | 10 | 4.50 | 45 | 111 |
| Harvesting(10% of yield) | Kg | 80 | 3.25 | 260 | 642 |
| Threshing (10% of yield) | Kg | 80 | 3.25 | 260 | 642 |
| Interest @ 12.5% per annum (for 6 months) | | | | 77 | 190 |
| Labor (additional) | Hr | 9 | 4.50 | 41 | 100 |
| Cleaning channels | Hr | 2 | 4.50 | 9 | 22 |
| Land rent | | | 1000.00 | 1000 | 2470 |
| Water rates etc | | | 30.00 | 30 | 74 |
| | *Variable Cost* | | | 1829 | 4518 |
| | *Total Cost* | | | 2909 | 7184 |
| Gross Margin | (Rs) | | | 1251 | 3089 |
| Net Income without rent | (Rs) | | | 1171 | 2893 |
| Net Income with rent | (Rs) | | | 171 | 423 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 55 | |
| Working Capital | (%) | | | 19 | |
| Investment in Land (@ Rs 80,000/Ac) | (%) | | | 3 | |

Source: Chaudhry and Ahmed 1982 (f,g), Ahmed (1988), Punjab Economic Research Institute 1988-89 (b), Aslam et al. (1989), Byerlee (1986), Government of Punjab 1987 (i,u), Chaudhry et al. 1992.

# WHEAT IN COTTON BASED CROPPING SYSTEM

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Grain | 40 Kg | 21 | 130 | 2730 | 6743 |
| Straw | 40 Kg | 42 | 12 | 504 | 1245 |
| *Output* | | | | 3234 | 7988 |
| *Costs* | | | | | |
| Rotavation | No | 0.1 | 150.00 | 15 | 37 |
| Ploughing | No | 3 | 50.00 | 150 | 371 |
| Ploughing & planking | No | 2 | 70.00 | 140 | 346 |
| Seed | Kg | 40 | 4.00 | 160 | 395 |
| Fertilizer(s) | | | | | |
| N | Kg | 42 | 9.13 | 383 | 947 |
| P | Kg | 22 | 8.17 | 180 | 444 |
| Manure | 40 Kg | 35 | 5.00 | 175 | 432 |
| Transport | 40 Kg | 35 | 0.50 | 18 | 43 |
| Irrigation | | | | | |
| Tubewell | Hr | 4 | 35.00 | 140 | 346 |
| Labor | Hr | 10 | 4.50 | 45 | 111 |
| Harvesting(10% of yield) | Kg | 84 | 3.25 | 273 | 674 |
| Threshing (10% of yield) | Kg | 84 | 3.25 | 273 | 674 |
| Interest @ 12.5% per annum (for 6 months) | | | | 88 | 217 |
| Labor (additional) | Hr | 9 | 4.50 | 41 | 100 |
| Cleaning channels | Hr | 2 | 4.50 | 9 | 22 |
| Land rent for 6 months | | | 1150.00 | 1150 | 2841 |
| Water rates etc | | | 30.00 | 30 | 74 |
| | *Variable Costs* | | | 2040 | 5038 |
| | *Total Cost* | | | 3269 | 8075 |
| Gross Margin | (Rs) | | | 1194 | 2950 |
| Net Income without rent | (Rs) | | | 1115 | 2754 |
| Net Income with rent | (Rs) | | | -35 | -87 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 32 | |
| Working Capital | (%) | | | 4 | |
| Investment in Land (Rs100,000/Ac) | (%) | | | 1 | |

Source: Chaudhry and Ahmed 1982 (c,d), 1986 (c,d), Punjab Economic Research Institute 1988-89 (b), Zulfiqar et al. (1988), Government of Punjab 1988-89 (i,k,u), Hobbs et al. 1989, Pakistan Agricultural Research Council 1986-87, Chaudhry et al. 1992.

# WHEAT IN BARANI AREAS

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Grain | 40 Kg | 10 | 130 | 1300 | 3211 |
| Straw | 40 Kg | 20 | 12 | 240 | 593 |
| Mustard Fodder | 40 Kg | 45 | 8 | 360 | 889 |
| *Output* | | | | 1900 | 4693 |
| *Costs* | | | | | |
| Deep Ploughing | No | 0.1 | 90.00 | 9 | 22 |
| Ploughing | No | 2 | 50.00 | 100 | 247 |
| Ploughing & planking | No | 2 | 70.00 | 140 | 346 |
| Seed | Kg | 40 | 4.00 | 160 | 395 |
| Fertilizer(s) | | | | | |
| N | Kg | 20 | 9.13 | 183 | 451 |
| P | Kg | 12 | 8.17 | 98 | 242 |
| Harvesting(10% of yield) | Kg | 40 | 3.25 | 130 | 321 |
| Threshing (10% of yield) | Kg | 40 | 3.25 | 130 | 321 |
| Interest @ 12.5% per annum (for 6 months) | | | | 43 | 106 |
| Labor (additional) | Hr | 37 | 4.50 | 164 | 406 |
| Land rent | | | 700.00 | 700 | 1729 |
| | *Variable Costs* | | | 993 | 2452 |
| | *Total Cost* | | | 1857 | 4587 |
| Gross Margin | (Rs) | | | 907 | 2241 |
| Net Income without rent | (Rs) | | | 743 | 1835 |
| Net Income with rent | (Rs) | | | 43 | 106 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 40 | |
| Working Capital | (%) | | | 12 | |
| Investment in Land (Rs 55,000/Ac) | (%) | | | 3 | |

Source: Chaudhry and Ahmed 1982 (a,c), 1986 (a,g), Hobbs et al. 1989, Punjab Economic Research Institute 1988-89 (b), Chaudhry et al. 1992.

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| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Paddy | 40 Kg | 18 | 175 | 3150 | 7781 |
| Straw | 40 Kg | 49 | 5 | 245 | 605 |
| *Output* | | | | 3395 | 8386 |
| *Costs* | | | | | |
| Preparatory tillage | | | | | |
| Ploughing & planking | No | 1 | 70.00 | 70 | 173 |
| Puddling | No | 4 | 100.00 | 400 | 988 |
| Planking | No | 3 | 40.00 | 120 | 296 |
| Raising nursery: Seed | Kg | 4 | 12.00 | 48 | 119 |
| Fertilizer & Pesticide | | | 40.00 | 40 | 99 |
| Manure | 40 Kg | 6 | 5.00 | 30 | 74 |
| Transport | 40 Kg | 6 | 0.50 | 3 | 7 |
| Transplanting | Day | 7.5 | 36.00 | 270 | 667 |
| Fertilizer(s) | | | | | |
| N | Kg | 16 | 9.13 | 146 | 361 |
| P | Kg | 10 | 8.17 | 82 | 202 |
| Zn | Kg | 5 | 12.00 | 60 | 148 |
| Irrigation | | | | | |
| Tubewell | Hr | 20 | 35.00 | 700 | 1729 |
| Labor | Day | 4 | 36.00 | 144 | 356 |
| Hand weeding | Day | 2 | 36.00 | 72 | 178 |
| Plant protection | | | | | |
| Pesticide & sprayer | | | 45.00 | 45 | 111 |
| Harvesting and cleaning (10 % of yield) | Kg | 72 | 4.38 | 315 | 778 |
| Interest @ 12.5% per annum (for 6 months) | | | | 139 | 344 |
| Labor (additional) | Hr | 8.5 | 4.50 | 38 | 94 |
| Cleaning channels | Hr | 2 | 4.50 | 9 | 22 |
| Land rent for 6 months | | | 1000.00 | 1000 | 2470 |
| Water rates etc | | | 70.00 | 70 | 173 |
| | *Variable Costs* | | | 2684 | 6630 |
| | *Total Cost* | | | 3801 | 9389 |
| Gross Margin | (Rs) | | | 711 | 1756 |
| Net Income without rent | (Rs) | | | 594 | 1466 |
| Net Income with rent | (Rs) | | | -406 | -1004 |
| Return to Labor | (Rs.day) | | | 21 | |
| Working Capital | (%) | | | -11 | |
| Investment in Land (@ Rs. 80,000/Ac) (@ Rs 80,000/Ac) | (%) | | | 1 | |

Source: Chaudhry and Ahmed, 1982 (f,g); 1988 (e,f), Government of Punjab 1987 (j); Majid and Iqbal, 1987; Punjab Economic Research Institute 1988-89(c); Chaudhry et. al 1992.

# BASMATI-385 RICE

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Paddy | 40 Kg | 21 | 160 | 3360 | 8299 |
| Straw | 40 Kg | 53 | 5 | 265 | 655 |
| *Output* | | | | 3625 | 8954 |
| *Costs* | | | | | |
| Preparatory tillage | | | | | |
| Ploughing & planking | No | 1 | 70.00 | 70 | 173 |
| Puddling | No | 4 | 100.00 | 400 | 988 |
| Planking | No | 3 | 40.00 | 120 | 296 |
| Raising nursery: Seed | Kg | 4 | 4.34 | 17 | 43 |
| Fertilizer & Pesticide | | | 30.00 | 30 | 74 |
| Manure | 40 Kg | 6 | 5.00 | 30 | 74 |
| Transport | 40 Kg | 6 | 0.50 | 3 | 7 |
| Transplanting | Day | 7.5 | 36.00 | 270 | 667 |
| Fertilizer(s) | | | | | |
| N | Kg | 22 | 9.13 | 201 | 496 |
| P | Kg | 13 | 8.17 | 106 | 262 |
| Irrigation | | | | | |
| Tubewell | Hr | 16 | 35.00 | 560 | 1383 |
| Labor | Day | 3.5 | 36.00 | 126 | 311 |
| Hand weeding | Day | 2 | 36.00 | 72 | 178 |
| Plant protection | | | | | |
| Pesticide & sprayer | | | 45.00 | 45 | 111 |
| Harvesting and cleaning | | | | | |
| (10 % of yield) | Kg | 84 | 4.00 | 336 | 830 |
| Interest @ 12.5% per annum | | | | | |
| (for 6 months) | | | | 128 | 317 |
| Labor (additional) | Hr | 8.5 | 4.50 | 38 | 94 |
| Cleaning channels | Hr | 4 | 4.50 | 18 | 44 |
| Land rent for 6 months | | | 1000.00 | 1000 | 2470 |
| Water rates etc | | | 70.00 | 70 | 173 |
| | *Variable Costs* | | | 2515 | 6211 |
| | *Total Cost* | | | 3641 | 8993 |
| Gross Margin | (Rs) | | | 1002 | 2475 |
| Net Income without rent | (Rs) | | | 984 | 2431 |
| Net Income with rent | (Rs) | | | -16 | -39 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 35 | |
| Working Capital | (%) | | | 5 | |
| Fixed Capital | (%) | | | 1 | |
| (Land @ Rs 80,000/Ac) | | | | | |

Source: Agricultural Economic Research Unit, Faisalabad, Sharif et al. 1989 Punjab Economic Research Institute 1988-89 (c), Government of Punjab, 1987 (j), Chaudhry et al. 1992.

## IRRI RICE

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Paddy | 40 Kg | 28 | 85 | 2380 | 5879 |
| Straw | 40 Kg | 42 | 5 | 210 | 519 |
| *Output* | | | | 2590 | 6397 |
| *Costs* | | | | | |
| Preparatory tillage | | | | | |
| Ploughing & planking | No | 1 | 70.00 | 70 | 173 |
| Puddling | No | 4 | 100.00 | 400 | 988 |
| Planking | No | 3 | 40.00 | 120 | 296 |
| Raising nursery: Seed | Kg | 4 | 7.00 | 28 | 69 |
| Fertilizer & Pesticide | | | 45.00 | 45 | 111 |
| Manure | 40 Kg | 6 | 5.00 | 30 | 74 |
| Transport | 40 Kg | 6 | 0.50 | 3 | 7 |
| Transplanting | Day | 7.5 | 36.00 | 270 | 667 |
| Fertilizer(s) | | | | | |
| N | Kg | 27 | 9.13 | 247 | 609 |
| P | Kg | 15 | 8.17 | 123 | 303 |
| Zn | Kg | 5 | 12.00 | 60 | 148 |
| Irrigation | | | | | |
| Tubewell | Hr | 16 | 35.00 | 560 | 1383 |
| Labor | Day | 3.5 | 36.00 | 126 | 311 |
| Hand weeding | Day | 2 | 36.00 | 72 | 178 |
| Plant protection | | | | | |
| Pesticide & sprayer | | | 50.00 | 50 | 124 |
| Harvesting and cleaning | | | | | |
| (10 % of yield) | Kg | 112 | 2.15 | 241 | 595 |
| Interest @ 12.5% per annum | | | | | |
| (for 6 months) | | | | 138 | 340 |
| Labor (additional) | Hr | 8.5 | 4.50 | 38 | 94 |
| Cleaning channels | Hr | 2 | 4.50 | 9 | 22 |
| Land rent for 6 months | | | 1000.00 | 1000 | 2470 |
| Water rates etc | | | 70.00 | 70 | 173 |
| | *Variable Costs* | | | 2582 | 6376 |
| | *Total Cost* | | | 3699 | 9136 |
| Gross Margin | (Rs) | | | 8 | 21 |
| Net Income without rent | (Rs) | | | -109 | -269 |
| Net Income with rent | (Rs) | | | -1109 | -2739 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | -7 | |
| Working Capital | (%) | | | -41 | |
| Fixed Capital | (%) | | | -0 | |
| (Land @ Rs 80,000/Ac) | | | | | |

Source: Chaudhry and Ahmed 1982 (f,g), 1986 (e,f), Government of Punjab 1987 (j), 1987-88 (y), Majid and Iqbal, 1987, Chaudhry et al. 1992.

# IRRIGATED MAIZE (Kharif)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Grain | 40 Kg | 25 | 150 | 3750 | 9263 |
| Stalks | 40 Kg | 32 | 10 | 320 | 790 |
| *Output* | | | | 4070 | 10053 |
| *Costs* | | | | | |
| Ploughing | No | 3 | 50.00 | 150 | 371 |
| Ploughing & planking | No | 3 | 70.00 | 210 | 519 |
| Sowing | No | 1 | 50.00 | 50 | 124 |
| Seed | Kg | 15 | 5.00 | 75 | 185 |
| Interculture | Day | 6 | 36.00 | 216 | 534 |
| Fertilizer(s) | | | | | |
| N | Kg | 38 | 9.13 | 347 | 857 |
| P | Kg | 19 | 8.17 | 155 | 383 |
| Manure | 40 Kg | 200 | 5.00 | 1000 | 2470 |
| Transport | 40 Kg | 200 | 0.50 | 30 | 74 |
| Labor | Day | 1 | 36.00 | 36 | 89 |
| Irrigation | | | | | |
| Tubewell | Hr | 4 | 35.00 | 140 | 346 |
| Labor | Hr | 16 | 4.50 | 72 | 178 |
| Thinning | Day | 2 | 36.00 | 72 | 178 |
| Harvesting | Day | 4 | 36.00 | 144 | 356 |
| Dehusking | Day | 2 | 36.00 | 72 | 178 |
| Shelling - machine | Hr | 1.0 | 115.00 | 115 | 284 |
| - labour | Hr | 4.0 | 4.50 | 18 | 44 |
| Interest @ 12.5% per annum (for 6 months) | | | | 160 | 394 |
| Labor (additional) | Hr | 2.5 | 4.50 | 11 | 28 |
| Cleaning channels | Hr | 2 | 4.50 | 9 | 22 |
| Land rent for 6 months | | | 1116.00 | 1116 | 2757 |
| Water rates etc | | | 25.00 | 25 | 62 |
| | *Variable Costs* | | | 3062 | 7563 |
| | *Total Cost* | | | 4223 | 10431 |
| Gross Margin | (Rs) | | | 1008 | 2490 |
| Net Income without rent | (Rs) | | | 963 | 2379 |
| Net Income with rent | (Rs) | | | -153 | -378 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 28 | |
| Working Capital | (%) | | | 0 | |
| Investment in Land (@ Rs 90,000/Ac) | (%) | | | 1.1 | |

Source: Akhtar et al. 1986, Chaudhry and Ahmed 1982 (b), 1986 (b), Tetlay et al. 1987; Government of Punjab 1983 (q); Pakistan Agricultural Research Council, 1984-85, 1986; Afzal.

## IRRIGATED MAIZE (Spring)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Grain | 40 Kg | 25 | 150 | 3750 | 9263 |
| Stalks | 40 Kg | 41 | 10 | 410 | 1013 |
| *Output* | | | | 4160 | 10275 |
| *Costs* | | | | | |
| Ploughing & planking | No | 4 | 70.00 | 280 | 692 |
| Sowing | No | 1 | 50.00 | 50 | 124 |
| Seed | Kg | 12 | 5.00 | 60 | 148 |
| Interculture | Day | 6 | 36.00 | 216 | 534 |
| Fertilizer(s) | | | | | |
| N | Kg | 45 | 9.13 | 411 | 1015 |
| P | Kg | 20 | 8.17 | 163 | 404 |
| Manure | 40 Kg | 200 | 5.00 | 1000 | 2470 |
| Transport | 40 Kg | 200 | 0.50 | 100 | 247 |
| Labor | Day | 1 | 36.00 | 36 | 89 |
| Irrigation | | | | | |
| Tubewell | Hr | 2 | 35.00 | 70 | 173 |
| Labor | Hr | 14 | 4.50 | 63 | 156 |
| Thinning | Day | 2 | 36.00 | 72 | 178 |
| Harvesting | Day | 4 | 36.00 | 144 | 356 |
| Dehusking | Day | 2 | 36.00 | 72 | 178 |
| Shelling - machine | Hr | 1.0 | 115.00 | 115 | 284 |
| - labour | Hr | 4.0 | 4.50 | 18 | 44 |
| Interest @ 12.5% per annum (for 6 months) | | | | 153 | 378 |
| Labor (additional) | Hr | 2.5 | 4.50 | 11 | 28 |
| Cleaning channels | Hr | 2 | 4.50 | 9 | 22 |
| Land rent for 6 months | | | 1116.00 | 1116 | 2757 |
| Water rates etc | | | 25.00 | 25 | 62 |
| | *Variable Costs* | | | 3023 | 7468 |
| | *Total Cost* | | | 4185 | 10336 |
| Gross Margin | (Rs) | | | 1137 | 2808 |
| Net Income without rent | (Rs) | | | 1091 | 2696 |
| Net Income with rent | (Rs) | | | -25 | -61 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 35 | |
| Working Capital | (%) | | | 5 | |
| Investment in Land (@ Rs 90,000/Ac) | (%) | | | 1 | |

Source: Akhtar et al. 1986; Tetlay et al. 1987; Government of Punjab 1983 (q); Pakistan Agricultural Research Council, 1984-85, 1986, Afzal.

## MAIZE BARANI (Kharif)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Grain | 40 Kg | 12 | 150 | 1800 | 4446 |
| Thinnings | 40 Kg | 20 | 6 | 120 | 296 |
| Stalks | 40 Kg | 20 | 10 | 200 | 494 |
| *Output* | | | | 2120 | 5236 |
| *Costs* | | | | | |
| Ploughing | No | 1 | 50.00 | 50 | 124 |
| Ploughing & planking | No | 2 | 70.00 | 140 | 346 |
| Sowing | No | 1 | 50.00 | 50 | 124 |
| Seed | Kg | 22 | 5.00 | 110 | 272 |
| Interculture | Day | 6 | 36.00 | 216 | 534 |
| Fertilizer(s) | | | | | |
| N | Kg | 20 | 9.13 | 183 | 451 |
| P | Kg | 8 | 8.17 | 65 | 161 |
| Manure | 40 Kg | 80 | 5.00 | 400 | 988 |
| Transport | 40 Kg | 80 | 0.50 | 40 | 99 |
| Labor | Day | 0.75 | 36.00 | 27 | 67 |
| Thinning | Day | 2 | 36.00 | 72 | 178 |
| Harvesting | Day | 3 | 36.00 | 108 | 267 |
| Dehusking | Day | 2 | 36.00 | 72 | 178 |
| Shelling - machine | Hr | 0.5 | 115.00 | 58 | 142 |
| - labor | Hr | 2 | 4.50 | 9 | 22 |
| Interest @ 12.5% per annum (for 6 months) | | | | 80 | 198 |
| Labor (additional) | Hr | 4.5 | 4.50 | 20 | 50 |
| Land rent for 6 months | | | 620.00 | 620 | 1531 |
| | *Variable Costs* | | | 1680 | 4148 |
| | *Total Cost* | | | 2320 | 5730 |
| Gross Margin | (Rs) | | | 440 | 1088 |
| Net Income without rent | (Rs) | | | 420 | 1038 |
| Net Income with rent | (Rs) | | | -200 | -493 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 23 | |
| Working Capital | (%) | | | -8 | |
| Investment in Land (@ Rs 55,000/Ac) | (%) | | | 0.8 | |

Source: Sheikh et al. 1987; Pakistan Agricultural Research Council, 1984, 198

## SUGARCANE (Fresh)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | s) |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Cane | 40 Kg | 475 | 17.50 | 8313 | 20532 |
| By-product | 40 Kg | 95 | 8 | 760 | 1877 |
| *Output* | | | | 9073 | 22409 |
| *Costs* | | | | | |
| Preparatory tillage | | | | | |
| Ploughing & planking | No | 7 | 50.00 | 350 | 865 |
| Planking | No | 6 | 25.00 | 150 | 371 |
| Levelling | No | 1 | 40.00 | 40 | 99 |
| Sowing of sets etc | Day | 9 | 36.00 | 324 | 800 |
| Cost of seed | Marla | 10 | 90.00 | 904 | 2232 |
| Manure | 40 Kg | 175 | 5.00 | 875 | 2161 |
| Transport | 40 Kg | 175 | 0.50 | 88 | 216 |
| Labor | Day | 1.5 | 36.00 | 54 | 133 |
| Fertilizer(s) | | | | | |
| N | Kg | 52 | 9.13 | 475 | 1173 |
| P | Kg | 16 | 8.17 | 131 | 323 |
| Irrigation | | | | | |
| Tubewell | Hr | 12 | 35.00 | 420 | 1037 |
| Labor | Day | 2 | 36.00 | 72 | 178 |
| Hoeing | Day | 4 | 36.00 | 144 | 356 |
| Inter-ploughing | No | 2 | 50.00 | 100 | 247 |
| Plant protection | | | 40.00 | 40 | 99 |
| Harvesting | | | | | |
| Labor | Day | 25 | 36.00 | 900 | 2223 |
| Transport | 40 Kg | 475 | 2.00 | 950 | 2347 |
| Interest @ 12.5% per annum | | | | 521 | 1286 |
| Labor (additional) | Day | 3.2 | 36.00 | 114 | 283 |
| Cleaning channels | Hr | 8 | 4.50 | 36 | 89 |
| Land rent | | | 2500.00 | 2500 | 6175 |
| Water rates etc | | | 80.00 | 80 | 198 |
| | *Variable Costs* | | | 6536 | 16145 |
| | *Total Cost* | | | 9267 | 22889 |
| Gross Margin | (Rs) | | | 2536 | 6264 |
| Net Income without rent | (Rs) | | | 2306 | 5695 |
| Net Income with rent | (Rs) | | | -194 | -480 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 32 | |
| Working Capital | (%) | | | 7 | |
| Investment in Land (@ Rs 90,000/Ac) | (%) | | | 3 | |

Source: Punjab Economic Research Institue 1988-89 (d), Chaudhry and Ahmed 1982 (b), 1986 (b), Government of Punjab 1987 (f), Nayyar et al. 1986, Pakistan Agricultural Research Council.

## SUGARCANE (Ratoon)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Cane | 40 Kg | 350 | 17.50 | 6125 | 15129 |
| By-product | 40 Kg | 70 | 8 | 560 | 1383 |
| *Output* | | | | 6685 | 16512 |
| *Costs* | | | | | |
| Fertilizer(s) | | | | | |
| N | Kg | 46 | 9 | 420 | 1037 |
| Irrigation | | | | | |
| Tubewell | Hr | 10 | 35 | 350 | 865 |
| Labor | Day | 4.25 | 36 | 153 | 378 |
| Inter-ploughing | No | 2 | 50 | 100 | 247 |
| Harvesting | | | | | |
| Labor | Day | 18 | 36 | 648 | 1601 |
| Transport | 40 Kg | 350 | 2 | 700 | 1729 |
| Interest @ 12.5% per annum | | | | 128 | 316 |
| Labor (additional) | Day | 2 | 36 | 72 | 178 |
| Cleaning channels | Hr | 4 | 5 | 18 | 44 |
| Land rent | | | 2500 | 2500 | 6175 |
| Water rates etc | | | 80 | 80 | 198 |
| | *Variable Costs* | | | 2499 | 6172 |
| | *Total Cost* | | | 5169 | 12767 |
| Gross Margin | (Rs) | | | 4186 | 10340 |
| Net Income without rent | (Rs) | | | 4016 | 9920 |
| Net Income with rent | (Rs) | | | 1516 | 3745 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 91 | |
| Working Capital | (%) | | | 143 | |
| Investment in Land (@ Rs 90,000/Ac) | (%) | | | 4 | |

Source: Punjab Economic Research Institute 1988-89 (d), Chaudhry and Ahmed 1982 (b), 1986 (b), Government of Punjab 1987 (f), Nayyar et al. 1986, Pakistan Agriculture Research Council.

## SEED COTTON IN COTTON BASED CROPPING SYSTEM

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Seed Cotton | 40 Kg | 18 | 350 | 6300 | 15561 |
| By-product (Sticks) | 40 Kg | 36 | 5 | 180 | 445 |
| *Output* | | | | 6480 | 16006 |
| *Costs* | | | | | |
| Preparatory tillage | | | | | |
| Ploughing | No | 5 | 50.00 | 250 | 618 |
| Ploughing & planking | No | 1 | 70.00 | 70 | 173 |
| Planking inc. levelling | No | 2 | 25.00 | 50 | 124 |
| Seed | Kg | 8 | 8.00 | 64 | 158 |
| Sowing - machine cost | Hr | 1 | 30.00 | 30 | 74 |
| Manure | 40 Kg | 5 | 5.00 | 25 | 62 |
| Transport | 40 Kg | 5 | 0.50 | 3 | 6 |
| Labor | Hr | 8 | 4.50 | 36 | 89 |
| Fertilizer(s) | | | | | |
| N | Kg | 62 | 9.13 | 566 | 1398 |
| P | Kg | 24 | 8.17 | 196 | 484 |
| Irrigation | | | | | |
| Tubewell | Hr | 6 | 35.00 | 210 | 519 |
| Labor | Hr | 10 | 4.50 | 45 | 111 |
| Inter-culture | | | | | |
| Hoeing & thinning | Day | 3 | 36.00 | 108 | 267 |
| Inter-ploughing | No | 2 | 50.00 | 100 | 247 |
| Plant protection | | | | | |
| Applications | No | 4 | 250.00 | 1000 | 2470 |
| Labor | Hr | 8 | 4.50 | 36 | 89 |
| Picking & Harvesting | | | | | |
| (1/14th of yield) | Kg | 51 | 8.75 | 450 | 1112 |
| Interest @ 12.5% per annum (for 6 months) | | | | 174 | 430 |
| Labor (additional) | Hr | 6.5 | 4.50 | 29 | 72 |
| Cleaning channels | Hr | 2 | 4.50 | 11 | 27 |
| Land rent for 6 months | | | 1900.00 | 1900 | 4693 |
| Water rates etc | | | 38.00 | 38 | 94 |
| | *Variable Costs* | | | 3413 | 8430 |
| | *Total Cost* | | | 5141 | 12699 |
| Gross Margin | (Rs) | | | 3067 | 7576 |
| Net Income without rent | (Rs) | | | 3239 | 8000 |
| Net Income with rent | (Rs) | | | 1339 | 3307 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 97 | |
| Working Capital | (%) | | | 45 | |
| Investment in Land (@ Rs100,000/Ac) | (%) | | | 3 | |

Source: Chaudhry and Ahmad, 1982 (b,c,d), 1986 (b,c,d), Punjab Economic Research Institute, 1988-89 (a), Chaudhry et al. 1992.

# SEED COTTON IN MIXED CROPPING SYSTEM

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Seed Cotton | 40 Kg | 15 | 350 | 5250 | 12968 |
| By-product | | 30 | 5 | 150 | 371 |
| *Output* | | | | 5400 | 13338 |
| *Costs* | | | | | |
| Preparatory tillage | | | | | |
| Ploughing | No | 5 | 50.00 | 250 | 618 |
| Planking inc. levelling | No | 2 | 25.00 | 50 | 124 |
| Seed | Kg | 6 | 8.00 | 48 | 119 |
| Sowing - machine cost | Hr | 1 | 30.00 | 30 | 74 |
| F.Y.M. | Tons | 1.5 | 125.00 | 188 | 463 |
| Transport | Tons | 1.5 | 12.50 | 19 | 46 |
| Labor | Hr | 4 | 4.50 | 18 | 44 |
| Fertilizer(s) | | | | | |
| N | Kg | 44 | 9.13 | 402 | 992 |
| P | Kg | 23 | 8.17 | 188 | 464 |
| Irrigation | | | | | |
| Water course cleaning | Hr | 2 | 4.50 | 11 | 27 |
| Tubewell | Hr | 10 | 35.00 | 350 | 865 |
| Labor | Hr | 12 | 4.50 | 54 | 133 |
| inter-culture | | | | | |
| Hoeing & thinning | Day | 3 | 36.00 | 108 | 267 |
| Inter-ploughing | No | 2 | 50.00 | 100 | 247 |
| Plant protection | | | | | |
| Applications | No | 4 | 250.00 | 1000 | 2470 |
| Labor | Hr | 6 | 4.50 | 27 | 67 |
| Picking & Harvesting | | | | | |
| (1/14th of yield) | Kg | 43 | 8.75 | 375 | 926 |
| Interest @ 12.5% per annum | | | | | |
| (for 6 months) | | | | 178 | 439 |
| Labor (additional) | Hr | 4 | 4.50 | 18 | 44 |
| Land rent for 6 months | | | 1400.00 | 1400 | 3458 |
| Water rates etc | | | 38.00 | 38 | 94 |
| | *Variable Costs* | | | 3394 | 8388 |
| | *Total Cost* | | | 4850 | 11986 |
| Gross Margin | (Rs) | | | 2006 | 4956 |
| Net Income without rent | (Rs) | | | 1950 | 4815 |
| Net Income with rent | (Rs) | | | 550 | 1357 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 29 | |
| Working Capital | (%) | | | 19.34% | |
| Fixed Capital | (%) | | | 2.17% | |
| (Land Rs 90,000/Ac) | | | | | |

Source: Chaudhry and Ahmad, 1982 (b,c,d), Punjab Economic Research Institute, 1988-89 (a), Chaudhry et al. 1992.

## GRAM (CHICKPEAS), Barani

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Main product | 40 Kg | 6 | 240.00 | 1440 | 3557 |
| By-product | 40 Kg | 4 | 10.00 | 40 | 99 |
| *Output* | | | | 1480 | 3656 |
| *Costs* | | | | | |
| Ploughing | No | 1 | 50.00 | 50 | 124 |
| Ploughing & planking | No | 2 | 70.00 | 140 | 346 |
| Seed | Kg | 20 | 9.80 | 196 | 484 |
| Sowing | No | 1 | 50.00 | 50 | 124 |
| Hoeing & weeding | Day | 2 | 36.00 | 72 | 178 |
| Harvesting | Day | 4 | 36.00 | 144 | 356 |
| Threshing | Day | 1 | 50.00 | 50 | 124 |
| Winnowing charge | Day | 1 | 36.00 | 36 | 89 |
| Interest @ 12.5% per annum (for 6 months) | | | | 32 | 78 |
| Labor (additional) | Hr | 2.5 | 4.50 | 11 | 28 |
| Land rent | | | 496.00 | 496 | 1225 |
| | *Variable Costs* | | | 770 | 1901 |
| | *Total Cost* | | | 1277 | 3154 |
| Gross Margin | (Rs) | | | 710 | 1754 |
| Net Income without rent | (Rs) | | | 699 | 1727 |
| Net Income with rent | (Rs) | | | 203 | 501 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 59 | |
| Working Capital | (%) | | | 43 | |
| Investment in Land (@ Rs 40,000/Ac) | (%) | | | 2 | |

Source: Chaudhry and Ahmad 1982 (a), 1986 (a,g), Government of Punjab, 1988-89 (m).

## LENTILS (Barani)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Main product | 40 Kg | 4.3 | 600.00 | 2580 | 6373 |
| By-product | 40 Kg | 2 | 6.00 | 12 | 30 |
| *Output* | | | | 2592 | 6402 |
| *Costs* | | | | | |
| Ploughing | No | 1 | 50.00 | 50 | 124 |
| Ploughing & planking | No | 2 | 70.00 | 140 | 346 |
| Seed | Kg | 10 | 18.00 | 180 | 445 |
| Sowing | No | 1 | 50.00 | 50 | 124 |
| Hoeing & weeding | Day | 2 | 36.00 | 72 | 178 |
| Harvesting | Day | 4 | 36.00 | 144 | 356 |
| Threshing | Day | 0.5 | 50.00 | 25 | 62 |
| Winnowing charge | Day | 0.5 | 36.00 | 18 | 44 |
| Interest @ 12.5% per annum (for 6 months) | | | | 31 | 76 |
| Labor (additional) | Hr | 2 | 4.50 | 9 | 22 |
| Land rent (for 6 months) | | | 620.00 | 620 | 1531 |
| | *Variable Costs* | | | 710 | 1753 |
| | *Total Cost* | | | 1339 | 3307 |
| Gross Margin | (Rs) | | | 1882 | 4649 |
| Net Income without rent | (Rs) | | | 1873 | 4627 |
| Net Income with rent | (Rs) | | | 1253 | 3096 |
| Return to: | | | | | |
| Labor | (Rs) | | | 198 | |
| Working Capital | (%) | | | 246 | |
| Investment in Land (Rs 55,000/Ac) | (%) | | | 3 | |

Source: Chaudhry and Ahmad 1982 (a,e), 1986 (a,g).

## MUNG (Barani)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Main product | 40 Kg | 4 | 425 | 1700 | 4199 |
| By-product | 40 Kg | 2 | 10 | 20 | 49 |
| *Output* | | | | 1720 | 4248 |
| *Costs* | | | | | |
| Ploughing | Nc | 1 | 50.00 | 50 | 124 |
| Ploughing & planking | No | 1 | 70.00 | 70 | 173 |
| Seed | Kg | 7 | 13.00 | 91 | 225 |
| Sowing | No | 1 | 50.00 | 50 | 124 |
| Hoeing and weeding | Day | 2 | 36.00 | 72 | 178 |
| Harvesting | Day | 4 | 36.00 | 144 | 356 |
| Threshing | Day | 0.5 | 50.00 | 25 | 62 |
| Winnowing charge | Day | 0.5 | 36.00 | 18 | 44 |
| Interest @ 12.5% per annum (for 6 months) | | | | 21 | 51 |
| Labor (additional) | Hr | 2.5 | 4.50 | 11 | 28 |
| Land rent | | | 496.00 | 496 | 1225 |
| | *Variable Costs* | | | 541 | 1336 |
| | *Total Cost* | | | 1048 | 2589 |
| Gross Margin | (Rs) | | | 1179 | 2913 |
| Net Income without rent | (Rs) | | | 1168 | 2885 |
| Net Income with rent | (Rs) | | | 672 | 1660 |
| Return to: | | | | | |
| Labcr | (Rs/day) | | | 123 | |
| Working Capital | (%) | | | 196 | |
| Investment in Land (@ Rs 40,000/Ac) | (%) | | | 3 | |

Source: Chaudhry and Ahmad 1982 (a,e), 1986 (a,g), Government of Punjab 1983

# MASH (Barani)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Main product | 40 Kg | 4 | 340 | 1360 | 3359 |
| By-product | 40 Kg | 2 | 5 | 10 | 25 |
| *Output* | | | | 1370 | 3384 |
| *Costs* | | | | | |
| Ploughing | No | 1 | 50.00 | 50 | 124 |
| Ploughing & planking | No | 2 | 70.00 | 140 | 346 |
| Seed | Kg | 7 | 10.00 | 70 | 173 |
| Sowing | No | 1 | 50.00 | 50 | 124 |
| Hoeing and weeding | Day | 2 | 36.00 | 72 | 178 |
| Harvesting | Day | 4 | 36.00 | 144 | 356 |
| Threshing | Day | 0.5 | 50.00 | 25 | 62 |
| Winnowing charge | Day | 0.5 | 36.00 | 18 | 44 |
| Interest @ 12.5% per annum (for 6 months) | | | | 24 | 59 |
| Labor (additional) | Hr | 2.5 | 4.50 | 11 | 28 |
| Land rent | | | 496.00 | 496 | 1225 |
| | *Variable Costs* | | | 593 | 1464 |
| | *Total Cost* | | | 1100 | 2717 |
| Gross Margin | (Rs) | | | 777 | 1919 |
| Net Income without rent | (Rs) | | | 766 | 1892 |
| Net Income with rent | (Rs) | | | 270 | 667 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 71 | |
| Working Capital | (%) | | | 72 | |
| Investment in Land (@ Rs 55,000/Ac) | (%) | | | 1 | |

Source: Chaudhry and Ahmad 1982 (a,e), 1986 (a,g), Government of Punjab 1983

# RAPESEED AND MUSTARD (Irrigated)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Main product | 40 Kg | 10.3 | 270 | 2768 | 6836 |
| By-product | | | | 20 | 49 |
| *Output* | | | | 2788 | 6885 |
| *Costs* | | | | | |
| Ploughing | No | 1 | 50.00 | 50 | 124 |
| Ploughing & planking | No | 3 | 70.00 | 210 | 519 |
| Seed | Kg | 2 | 8.00 | 16 | 40 |
| Sowing | No | 1 | 50.00 | 50 | 124 |
| Fertilizer(s) | | | | | |
| N | Kg | 20 | 9.13 | 183 | 451 |
| P | Kg | 12 | 8.17 | 98 | 242 |
| Irrigation | | | | | |
| Tubewell | Hr | 2 | 35.00 | 70 | 173 |
| Labor | Hr | 4 | 4.50 | 18 | 44 |
| Harvesting | Day | 4 | 36.00 | 144 | 356 |
| Threshing | Day | 1 | 50.00 | 50 | 124 |
| Winnowing charge | Day | 2 | 36.00 | 72 | 178 |
| Interest @ 12.5% per annum (for 6 months) | | | | 43 | 107 |
| Labor (additional) | Hr | 3.5 | 4.50 | 16 | 39 |
| Cleaning channels | Hr | 2 | 4.50 | 9 | 22 |
| Land rent | | | 744.00 | 744 | 1838 |
| Water rates etc | | | 30.00 | 30 | 74 |
| | *Variable Costs* | | | 1004 | 2480 |
| | *Total Cost* | | | 1803 | 4453 |
| Gross Margin | (Rs) | | | 1783 | 4405 |
| Net Income without rent | (Rs) | | | 1729 | 4270 |
| Net Income with rent | (Rs) | | | 985 | 2432 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 149 | |
| Working Capital | (%) | | | 139 | |
| Investment in Land (Rs 70,000/Ac) | (%) | | | 2 | |

Source: Government of Punjab 1988-89 (e,o), and Professor M.S Nazar, Department of Agronomy, University of Agriculture, Faisalabad.

# SUNFLOWER (Irrigated)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Seed | 40 Kg | 25 | 270 | 6750 | 16673 |
| Stalk | 40 Kg | 25 | 4 | 100 | 247 |
| *Output* | | | | 6850 | 16920 |
| *Costs* | | | | | |
| Ploughing | No | 1 | 50.00 | 50 | 124 |
| Ploughing & Planking | No | 2 | 70.00 | 140 | 346 |
| Seed | Kg | 2.5 | 80.00 | 200 | 494 |
| Sowing | No | 1 | 50.00 | 50 | 124 |
| Fertilizer(s) | | | | | |
| N | Kg | 35 | 9.13 | 320 | 789 |
| P | Kg | 25 | 8.17 | 204 | 504 |
| Inter-culture | Day | 6 | 36.00 | 216 | 534 |
| Irrigation | | | | | |
| Tubewell | Hr | 4 | 35.00 | 140 | 346 |
| Labor | Hr | 8 | 4.50 | 36 | 89 |
| Harvesting | Day | 4 | 36.00 | 144 | 356 |
| Threshing/winnowing | Day | 4 | 36.00 | 144 | 356 |
| Interest @ 12.5% per annum (for 6 months) | | | | 85 | 209 |
| Labor (additional) | Hr | 2.5 | 4.50 | 11 | 28 |
| Cleaning channels | Hr | 2 | 4.50 | 9 | 22 |
| Land rent (for 6 months) | | | 1116.00 | 1116 | 2757 |
| Water rates etc | | | 35.00 | 35 | 86 |
| | *Variable Costs* | | | 1729 | 4269 |
| | *Total Cost* | | | 2900 | 7162 |
| Gross Margin | (Rs) | | | 5121 | 12650 |
| Net Income without rent | (Rs) | | | 5066 | 12514 |
| Net Income with rent | (Rs) | | | 3950 | 9757 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 281 | |
| Working Capital | (%) | | | 280 | |
| Investment in Land (@ Rs 90,000/Ac) | (%) | | | 6 | |

Source: Government of Punjab 1988-89 (e,o), and Professor M.S. Nazar, Department of Agronomy, University of Agriculture, Faisalabad.

## SAFFLOWER (Irrigated)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Seed | 40 Kg | 9.4 | 216 | 2030 | 5015 |
| *Output* | | | | 2030 | 5015 |
| *Costs* | | | | | |
| Ploughing | No | 1 | 50.00 | 50 | 124 |
| Ploughing & Planking | No | 2 | 70.00 | 140 | 346 |
| Seed | Kg | 8 | 6.00 | 48 | 119 |
| Sowing | No | 1 | 50.00 | 50 | 124 |
| Fertilizer(s) | | | | | |
| N | Kg | 11 | 9.13 | 100 | 248 |
| P | Kg | 11 | 8.17 | 90 | 222 |
| Inter-culture | Day | 6 | 36.00 | 216 | 534 |
| Irrigation | | | | | |
| Tubewell | Hr | 2 | 35.00 | 70 | 173 |
| Labor | Hr | 4 | 4.50 | 18 | 44 |
| Harvesting | Day | 4 | 36.00 | 144 | 356 |
| Threshing/winnowing | Day | 4 | 36.00 | 144 | 356 |
| Interest @ 12.5% per annum (for 6 months) | | | | 49 | 121 |
| Labor (additional) | Hr | 2.5 | 4.50 | 11 | 28 |
| Cleaning channels | Hr | 2 | 4.50 | 9 | 22 |
| Land rent (for 6 months) | | | 1116.00 | 1116 | 2757 |
| Water rates etc | | | 35.00 | 35 | 86 |
| | *Variable Costs* | | | 1119 | 2764 |
| | *Total Cost* | | | 2290 | 5657 |
| Gross Margin | (Rs) | | | 911 | 2251 |
| Net Income without rent | (Rs) | | | 856 | 2114 |
| Net Income with rent | (Rs) | | | -260 | -642 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 20 | |
| Working Capital | (%) | | | -25 | |
| Investment in Land (@ Rs 80,000/Ac) | (%) | | | 1 | |

Source: Government of Punjab 1988-89 (e,o), and Professor M.S. Nazar, Department of Agronomy, University of Agriculture, Faisalabad.

# CANOLA (Barani)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Main product | 40 Kg | 15 | 268 | 4020 | 9929 |
| *Output* | | | | 4020 | 9929 |
| *Costs* | | | | | |
| Deep ploughing | No | 1 | 90.00 | 90 | 222 |
| Ploughing | No | 3 | 50.00 | 150 | 371 |
| Ploughing & planking | No | 2 | 70.00 | 140 | 346 |
| Seed | Kg | 2 | 8.00 | 16 | 40 |
| Sowing | No | 1 | 50.00 | 50 | 124 |
| Fertilizer(s) | | | | | |
| N | Kg | 32 | 9.13 | 292 | 722 |
| P | Kg | 23 | 8.17 | 188 | 464 |
| Harvesting | Day | 5 | 36.00 | 180 | 445 |
| Threshing | Day | 1.25 | 36.00 | 45 | 111 |
| Winnowing charge | Day | 2.5 | 36.00 | 90 | 222 |
| Interest @ 12.5% per annum (for 6 months) | | | | 58 | 143 |
| Labor (additional) | Hr | 3.5 | 4.50 | 16 | 39 |
| Land rent | | | 620.00 | 620 | 1531 |
| | *Variable Costs* | | | 1299 | 3208 |
| | *Total Cost* | | | 1935 | 4779 |
| Gross Margin | (Rs) | | | 2721 | 6721 |
| Net Income without rent | (Rs) | | | 2705 | 6682 |
| Net Income with rent | (Rs) | | | 2085 | 5151 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 237 | |
| Working Capital | (%) | | | 218 | |
| Investment in Land (@ Rs 55,000/Ac) | (%) | | | 5 | |

Source: Oilseed Program, National Agriculture Research Centre (NARC).

## SOYABEANS (Irrigated)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Beans | 40 Kg | 19 | 240 | 4560 | 11263 |
| Straw | 40 Kg | 19 | 10 | 190 | 469 |
| *Output* | | | | 4750 | 11733 |
| *Costs* | | | | | |
| Ploughing | No | 1 | 50.00 | 50 | 124 |
| Ploughing & planking | No | 2 | 70.00 | 140 | 346 |
| Seed | Kg | 35 | 7.00 | 245 | 605 |
| Sowing | No | 1 | 50.00 | 50 | 124 |
| Fertilizer(s) | | | | | |
| N | Kg | 25 | 9.17 | 229 | 566 |
| P | Kg | 40 | 8.17 | 327 | 807 |
| Irrigation | | | | | |
| Tubewell | Hr | 2 | 35.00 | 70 | 173 |
| Labor | Hr | 8 | 4.50 | 36 | 89 |
| Harvesting | Day | 4 | 36.00 | 144 | 356 |
| Threshing | Day | 4 | 36.00 | 144 | 356 |
| Winnowing charge | Day | 2 | 36.00 | 72 | 178 |
| Interest @ 12.5% per annum (for 6 months) | | | | 72 | 177 |
| Labor (additional) | Hr | 2.5 | 4.50 | 11 | 28 |
| Cleaning channels | Hr | 2 | 4.50 | 9 | 22 |
| Land rent | | | 1116.00 | 1116 | 2757 |
| Water Rates | Rs. | | 35.00 | 35 | 86 |
| | *Variable Costs* | | | 1579 | 3899 |
| | *Total Cost* | | | 2750 | 6792 |
| Gross Margin | (Rs) | | | 3171 | 7833 |
| Net Income without rent | (Rs) | | | 3116 | 7697 |
| Net Income with rent | (Rs) | | | 2000 | 4940 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 201 | |
| Working Capital | (%) | | | 170 | |
| Investment in Land (@ Rs 80,000/Ac) | (%) | | | 4 | |

Source: Government of Punjab 1988-89 (e,o), and Professor M.S. Nazar, Department of agronomy, University of Agriculture, Faisalabad.

# GROUNDNUT (Barani)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Produce | 40 Kg | 10 | 600 | 6000 | 14820 |
| *Output* | | | | 6000 | 14820 |
| *Costs* | | | | | |
| Deep ploughing | No | 1 | 90.00 | 90 | 222 |
| Ploughing | No | 1 | 50.00 | 50 | 124 |
| Ploughing & planking | No | 2 | 70.00 | 140 | 346 |
| Seed | Kg | 30 | 18.00 | 540 | 1334 |
| Sowing | No | 1 | 50.00 | 50 | 124 |
| Fertilizer (N) | Kg | 5 | 9.13 | 46 | 113 |
| Hoeing and weeding | Day | 1 | 36.00 | 36 | 89 |
| Harvesting | Day | 12 | 36.00 | 432 | 1067 |
| Digging | Day | 5 | 36.00 | 180 | 445 |
| Drying & winnowing | Day | 5 | 36.00 | 180 | 445 |
| Interest @ 12.5% per annum (for 6 months) | | | | 54 | 133 |
| Labor (additional) | Hr | 9.5 | 4.50 | 43 | 106 |
| Land rent | | | 496.00 | 496 | 1225 |
| | *Variable Costs* | | | 1798 | 4440 |
| | *Total Cost* | | | 2246 | 5548 |
| Gross Margin | (Rs) | | | 4202 | 10380 |
| Net Income without rent | (Rs) | | | 4250 | 10497 |
| Net Income with rent | (Rs) | | | 3754 | 9272 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 182 | |
| Working Capital | (%) | | | 416 | |
| Investment in Land (@ Rs 50,000/Ac) | (%) | | | 8 | |

Source: Chaudhry and Ahmad 1982 (a), 1986 (a), Government of Punjab 1987 (g)

## POTATOES (AUTUMN CROP)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Produce | 40 Kg | 200 | 140 | 28000 | 69160 |
| *Output* | | | | 28000 | 69160 |
| *Costs* | | | | | |
| Preparatory tillage | | | | | |
| Furrow turning | No | 1 | 90.00 | 90 | 222 |
| Ploughing | No | 1 | 50.00 | 50 | 124 |
| Ploughing & planking | No | 4 | 70.00 | 280 | 692 |
| Seed | Ton | 1.2 | 6000 00 | 7200 | 17784 |
| Sowing | Day | 12 | 36.00 | 432 | 1067 |
| Manure | 40 Kg | 375 | 5.00 | 1875 | 4631 |
| Transport | 40 Kg | 375 | 0.50 | 188 | 463 |
| Labor | Day | 2 | 36.00 | 72 | 178 |
| Fertilizer(s) | | | | | |
| N | Kg | 64 | 9.13 | 584 | 1443 |
| P | Kg | 46 | 8.17 | 376 | 928 |
| K | Kg | 32.5 | 7.80 | 254 | 626 |
| Irrigation | | | | | |
| Tubewell | Hr | 4 | 35.00 | 140 | 346 |
| Labor | Day | 2 | 36.00 | 72 | 178 |
| Inter-culture | Day | 20 | 36.00 | 720 | 1778 |
| Plant protec'n measures | No | 3 | 108.00 | 324 | 800 |
| Harvesting | | | | | |
| Picking | Day | 24 | 36.00 | 864 | 2134 |
| Transport | 40 Kg | 200 | 2.00 | 400 | 988 |
| Interest @ 12.5% per annum (for 6 months) | | | | 791 | 1954 |
| Labor (additional) | Hr | 8 | 4.50 | 36 | 89 |
| Cleaning channels | Hr | 2 | 4.50 | 9 | 22 |
| Land rent (for 6 months) | | | 2232.00 | 2232 | 5513 |
| Water rates etc | | | 50.00 | 50 | 124 |
| | *Variable Costs* | | | 14711 | 36337 |
| | *Total Cost* | | | 17038 | 42084 |
| Gross Margin | (Rs) | | | 13289 | 32823 |
| Net Income without rent | (Rs) | | | 13194 | 32589 |
| Net Income with rent | (Rs) | | | 10962 | 27076 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 214 | |
| Working Capital | (%) | | | 87 | |
| Investment in Land (@ Rs 125,000/Ac) | (%) | | | 11 | |

Source: Government of Punjab 1989 (I), 1983-84 (p), Pakistan Agricultural Research Council, 1981.

## ONIONS

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Produce | 40 Kg | 125 | 100 | 12500 | 30875 |
| *Output* | | | | 12500 | 30875 |
| *Costs* | | | | | |
| Preparatory tillage | | | | | |
| Furrow turning | No | 1 | 90.00 | 90 | 222 |
| Ploughing | No | 1 | 50.00 | 50 | 124 |
| Ploughing & planking | No | 2 | 70.00 | 140 | 346 |
| Seed | Kg | 3 | 80.00 | 240 | 593 |
| Nursery labour | Day | 4 | 36.00 | 144 | 356 |
| Sowing | Day | 20 | 36.00 | 720 | 1778 |
| Manure | 40 Kg | 250 | 5.00 | 1250 | 3088 |
| Transport | 40 Kg | 250 | 0.50 | 125 | 309 |
| Labor | Day | 1.5 | 36.00 | 54 | 133 |
| Fertilizer(s) | | | | | |
| N | Kg | 32 | 9.13 | 292 | 722 |
| P | Kg | 23 | 8.17 | 188 | 464 |
| K | Kg | 32.5 | 7.80 | 254 | 626 |
| Labor | Day | 1 | 36.00 | 36 | 89 |
| Irrigation | | | | | |
| Tubewell | Hr | 2 | 35.00 | 70 | 173 |
| Labor | Day | 1 | 36.00 | 36 | 89 |
| Inter-culture | Day | 20 | 36.00 | 720 | 1778 |
| Harvesting | | | | | |
| Picking | Day | 20 | 36.00 | 720 | 1778 |
| Interest @ 12.5% per annum (for 6 months) | | | | 276 | 681 |
| Labor (additional) | Hr | 15 | 4.50 | 68 | 167 |
| Cleaning channels | Hr | 2 | 4.50 | 9 | 22 |
| Land rent (for 6 months) | | | 2232.00 | 2232 | 5513 |
| Water rates etc | | | 50.00 | 50 | 124 |
| | *Variable Costs* | | | 5404 | 13348 |
| | *Total Cost* | | | 7763 | 19174 |
| Gross Margin | (Rs) | | | 7096 | 17527 |
| Net Income without rent | (Rs) | | | 6969 | 17214 |
| Net Income with rent | (Rs) | | | 4737 | 11701 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 105 | |
| Working Capital | (%) | | | 107 | |
| Investment in Land (@ Rs 125,000/Ac) | (%) | | | 6 | |

Source: Prepared in consultation with the Staff of Horticulture Department, University of Agriculture, Faisalabad.

## CHILLIES

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Produce | 40 kg | 16 | 989.00 | 15824 | 39085 |
| *Output* | | | | 15824 | 39085 |
| *Costs* | | | | | |
| Preparatory tillage | | | | | |
| Furrow turning | No | 1 | 90.00 | 90 | 222 |
| Ploughing & planking | No | 3 | 70.00 | 210 | 519 |
| Seed | Kg | 2.0 | 70.00 | 140 | 346 |
| Sowing | Day | 10 | 36.00 | 360 | 889 |
| Manure | 40 kg | 400 | 5.00 | 2000 | 4940 |
| Transport | 40 kg | 400 | 0.50 | 200 | 494 |
| Labor | Day | 4 | 36.00 | 144 | 356 |
| Fertilizer(s) | | | | | |
| N | Kg | 32 | 9.13 | 292 | 722 |
| P | Kg | 23 | 8.17 | 188 | 464 |
| K | Kg | 30 | 7.80 | 234 | 578 |
| Labor | Hr | 1.5 | 4.50 | 7 | 17 |
| Irrigation | | | | | |
| Tubewell | Hr | 8 | 35.00 | 280 | 692 |
| Labour | Day | 2 | 36.00 | 72 | 178 |
| Inter-culture | Day | 24 | 36.00 | 864 | 2134 |
| Plant protec'n measures | No | 4 | 162.00 | 648 | 1601 |
| Harvesting | | | | | |
| Picking | Day | 20 | 36.00 | 720 | 1778 |
| Transport | 40 Kg | 16 | 10.00 | 160 | 395 |
| Interest @ 12.5% per annum (for 6 months) | | | | 358 | 884 |
| Labor (additional) | Hr | 6 | 4.50 | 27 | 67 |
| Cleaning channels | Hr | 2 | 4.50 | 9 | 22 |
| Land rent | | | 2232.00 | 2232 | 5513 |
| Water rates etc | | | 50.00 | 50 | 124 |
| | *Variable Costs* | | | 6967 | 17208 |
| | *Total Cost* | | | 9285 | 22934 |
| Gross Margin | (Rs) | | | 8857 | 21877 |
| Net Income without rent | (Rs) | | | 8771 | 21665 |
| Net Income with rent | (Rs) | | | 6539 | 16152 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 142 | |
| Working Capital | (%) | | | 113 | |
| Investment in Land (@ Rs 125,000/Ac) | (%) | | | 7 | |

Source: Prepared in consultation with the Staff of Horticulture Department, University of Agriculture, Faisalabad and Government of Punjab, 1983 (r).

## TOMATOES

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Produce | 40 kg | 113 | 160 | 18080 | 44658 |
| *Output* | | | | 18080 | 44658 |
| *Costs* | | | | | |
| Preparatory tillage | | | | | |
| Furrow turning | No | 1 | 90.00 | 90 | 222 |
| Ploughing & planking | No | 3 | 70.00 | 210 | 519 |
| Seed | kg | 0.1 | 500.00 | 50 | 124 |
| Nusery labour | Day | 2 | 36.00 | 72 | 178 |
| Transplanting labour | Day | 16 | 36.00 | 576 | 1423 |
| Manure | 40 kg | 200 | 5.00 | 1000 | 2470 |
| Transport | 40 kg | 200 | 0.50 | 100 | 247 |
| Labor | Day | 1.5 | 36.00 | 54 | 133 |
| Fertilizer(s) | | | | | |
| N | Kg | 41 | 9.17 | 376 | 929 |
| P | Kg | 61 | 8.17 | 498 | 1231 |
| K | Kg | 24 | 7.80 | 187 | 462 |
| Labor | Hr | 1.5 | 4.50 | 7 | 17 |
| Irrigation | | | | | |
| Tubewell | Hr | 4 | 35.00 | 140 | 346 |
| Labor | Day | 1.5 | 36.00 | 54 | 133 |
| Inter-culture | Day | 30 | 36.00 | 1080 | 2668 |
| Plant protec'n measures | | | 324.00 | 324 | 800 |
| Harvesting | | | | | |
| Picking | Day | 25 | 36.00 | 900 | 2223 |
| Transport | 40 Kg | 113 | 3.00 | 339 | 837 |
| Interest @ 12.5% per annum (for 6 months) | | | | 301 | 744 |
| Labor (additional) | Hr | 8 | 4.50 | 36 | 89 |
| Cleaning channels | Hr | 2 | 4.50 | 9 | 22 |
| Land rent | | | 2232.00 | 2232 | 5513 |
| Water rates etc | | | 40.00 | 40 | 99 |
| | *Variable Costs* | | | 6358 | 15705 |
| | *Total Cost* | | | 8675 | 21428 |
| Gross Margin | (Rs) | | | 11722 | 28952 |
| Net Income without rent | (Rs) | | | 11637 | 28742 |
| Net Income with rent | (Rs) | | | 9405 | 23229 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 157 | |
| Working Capital | (%) | | | 190 | |
| Investment in Land (@ Rs 125,000/Ac) | (%) | | | 9 | |

Source: Prepared in consultation with the Staff of Horticulture Department, University of Agriculture, Faisalabad.

## WATER MELON

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Produce | 40 kg | 175 | 40.00 | 7000 | 17290 |
| *Output* | | | | 7000 | 17290 |
| *Costs* | | | | | |
| Preparatory tillage | | | | | |
| Furrow turning | No | 1 | 90.00 | 90 | 222 |
| Ploughing & planking | No | 4 | 70.00 | 280 | 692 |
| Seed | Kg | 1.5 | 40.00 | 60 | 148 |
| Sowing | Day | 12 | 36.00 | 432 | 1067 |
| Manure | 40 kg | 175 | 5.00 | 875 | 2161 |
| Transport | 40 kg | 175 | 0.50 | 88 | 216 |
| Labor | Day | 1 | 36.00 | 36 | 89 |
| Fertilizer(s) | | | | | |
| N | Kg | 52.5 | 9.13 | 479 | 1184 |
| P | Kg | 24 | 8.17 | 196 | 484 |
| K | Kg | 30 | 7.80 | 234 | 578 |
| Labor | Hr | 1.5 | 4.50 | 7 | 17 |
| Irrigation | | | | | |
| Tubewell | Hr | 4 | 35.00 | 140 | 346 |
| Labor | Day | 1 | 36.00 | 36 | 89 |
| Inter-culture | Day | 10 | 36.00 | 360 | 889 |
| Plant protec'n measures | | | 324.00 | 324 | 800 |
| Harvesting | | | | | |
| Picking | Day | 10 | 36.00 | 360 | 889 |
| Transport | 40 Kg | 175 | 1.50 | 263 | 648 |
| Interest @ 12.5% per annum (for 6 months) | | | | 227 | 561 |
| Labor (additional) | Hr | 8 | 4.50 | 36 | 89 |
| Cleaning channels | Hr | 2 | 4.50 | 9 | 22 |
| Land rent | | | 992.00 | 992 | 2450 |
| Water rates etc | | | 35.00 | 35 | 86 |
| | *Variable Costs* | | | 4486 | 11082 |
| | *Total Cost* | | | 5558 | 13729 |
| Gross Margin | (Rs) | | | 2514 | 6208 |
| Net Income without rent | (Rs) | | | 2434 | 6011 |
| Net Income with rent | (Rs) | | | 1442 | 3561 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 76 | |
| Investment in Land | (%) | | | 46 | |
| Fixed Capital (Land @ Rs 40,000/Ac) | (%) | | | 6 | |

Source: Prepared in consultation with the Staff of Horticulture Department, University of Agriculture, Faisalabad.

## MUSK MELON

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Produce | 40 kg | 125 | 100 | 12500 | 30875 |
| *Output* | | | | 12500 | 30875 |
| *Costs* | | | | | |
| Preparatory tillage | | | | | |
| Furrow turning | No | 1 | 90.00 | 90 | 222 |
| Ploughing & planking | No | 4 | 70.00 | 280 | 692 |
| Seed | Kg | 1.5 | 30.00 | 45 | 111 |
| Sowing | Day | 12 | 36.00 | 432 | 1067 |
| Manure | 40 kg | 175 | 5.00 | 875 | 2161 |
| Transport | 40 kg | 175 | 0.50 | 88 | 216 |
| Labor | Day | 1 | 36.00 | 36 | 89 |
| Fertilizer(s) | | | | | |
| N | Kg | 33.5 | 9.13 | 306 | 755 |
| P | Kg | 24 | 8.17 | 196 | 484 |
| K | Kg | 30 | 7.80 | 234 | 578 |
| Labor | Hr | 1.5 | 4.50 | 7 | 17 |
| Irrigation | | | | | |
| Tubewell | Hr | 4 | 35.00 | 140 | 346 |
| Labor | Day | 1 | 36.00 | 36 | 89 |
| Inter-culture | Day | 10 | 36.00 | 360 | 889 |
| Plant protec'n measures | | | 324.00 | 324 | 800 |
| Harvesting | | | | | |
| Picking | Day | 10 | 36.00 | 360 | 889 |
| Transport | 40 Kg | 100 | 15.00 | 1500 | 3705 |
| Interest @ 12.5% per annum (for 6 months) | | | | 216 | 532 |
| Labor (additional) | Hr | 8 | 4.50 | 36 | 89 |
| Cleaning channels | Hr | 2 | 4.50 | 9 | 22 |
| Land rent | | | 992.00 | 992 | 2450 |
| Water rates etc | | | 35.00 | 35 | 86 |
| | *Variable Costs* | | | 5524 | 13644 |
| | *Total Cost* | | | 6596 | 16291 |
| Gross Margin | (Rs) | | | 6976 | 17231 |
| Net Income without rent | (Rs) | | | 6896 | 17034 |
| Net Income with rent | (Rs) | | | 5904 | 14584 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 201 | |
| Working Capital | (%) | | | 167 | |
| Fixed Capital (Land @ Rs 70,000/Ac) | (%) | | | 9.9 | |

Source: Prepared in consultation with the Staff of Horticulture Department, Unversity of Agriculture, Faisalabad.

# MANGO ORCHARD

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Output | | Per Ac | Per Ac | Per Ac | Per Ha |
| Year 7 to 12 | Tree | 25 | 17500 | 105000 | 259350 |
| 70 kg/year/tree | | | | | |
| Year 13 to 40 | Tree | 25 | 30000 | 840000 | 2074800 |
| 120 kg/year/tree | | | | | |
| Present Value of Output | | | | 97934 | 241897 |
| 12 % Rate of Discount | | | | | |
| | *Per Year Basis* | | | | |
| **Costs** | | | | | |
| | *First Year* | | | | |
| Land preparation | | | | | |
| Ploughing | No | 2 | 50.00 | 100 | 247 |
| Ploughing & planking | No | 1 | 70.00 | 70 | 173 |
| Layout for plants | Day | 2 | 36.00 | 72 | 178 |
| Digging,planting & fil'ng | Day | 7 | 36.00 | 252 | 622 |
| Manure (incl. carriage) | Tons | 5 | 125.00 | 625 | 1544 |
| Mango grafts | | 25 | 35.00 | 875 | 2161 |
| Silt | Tons | 5 | 25.00 | 125 | 309 |
| Care of plants | Month | 12 | 300.00 | 3600 | 8892 |
| Hedges & windbreaks | Day | 8 | 36.00 | 288 | 711 |
| Water rates etc | | | 82.00 | 82 | 203 |
| Covering of plants | No | 25 | 12.00 | 300 | 741 |
| | First Year Total | | | 6389 | 15781 |
| | *Years 2 to 6* | | | | |
| Care of plants | Month | 60 | 300.00 | 18000 | 44460 |
| Replacement @ 30% | Plant | 8 | 35.00 | 280 | 692 |
| Basing | | | | | |
| Interculture - ploughing | No | 40 | 50.00 | 2000 | 4940 |
| Hoeing | Day | 30 | 36.00 | 1080 | 2668 |
| Manure (incl. carriage) | Tons | 16 | 125.00 | 2000 | 4940 |
| Fertilizer (N) | Kg | 115 | 9.13 | 1050 | 2593 |
| P | Kg | 24 | 8.17 | 196 | 484 |
| K | Kg | 32 | 7.80 | 250 | 617 |
| Plant protection | Per Yr | | 216.00 | 1080 | 2668 |
| Land rent | Per Yr | | 1240.00 | 6200 | 15314 |
| Miscellaneous charges | Per Yr | | 756.00 | 3780 | 9337 |
| Water rates etc | Per Yr | | 82.00 | 410 | 1013 |
| Covering of plants | Per Yr | | 300.00 | 1500 | 3705 |
| | Year 2 to 6 total | | | 36326 | 89724 |
| | Present Worth | | | 30052 | 74227 |

**continued on the next page**

## MANGO ORCHARD - contin'd

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| | | Per Ac | Per Ac | Per Ac | Per Ha |
| | *Years 7 to 12* | | | | |
| Care of plants | Month | 72 | 300.00 | 21600 | 53352 |
| Interculture - ploughing | No | 48 | 50.00 | 2400 | 5928 |
| Hoeing | Day | 36 | 36.00 | 1296 | 3201 |
| Manure (incl. carriage) | Tons | 144 | 125.00 | 18000 | 44460 |
| Fertilizer (N) | Kg | 189 | 9.13 | 1726 | 4262 |
| P | Kg | 60 | 8.17 | 490 | 1211 |
| K | Kg | 75 | 7.80 | 585 | 1445 |
| Plant protection | Per Yr | | 756.00 | 3780 | 9337 |
| Land rent | Per Yr | | 2480.00 | 14880 | 36754 |
| Miscellaneous charges | Per Yr | | 484.00 | 2904 | 7173 |
| Water rates etc | Per Yr | | 82.00 | 492 | 1215 |
| | Years 7 to 12 total | | | 68153 | 168337 |
| | Present Worth | | | 23728 | 58609 |
| | *Years 13 to 40* | | | | |
| Care of plants | Month | 312 | 300.00 | 93600 | 231192 |
| Interculture - ploughing | No | 262 | 50.00 | 13100 | 32357 |
| Hoeing | Day | 156 | 36.00 | 5616 | 13872 |
| Manure (incl. carriage) | Tons | 1248 | 125.00 | 156000 | 385320 |
| Fertilizer (N) | Kg | 1104 | 9.13 | 10080 | 24896 |
| P | Kg | 520 | 8.17 | 4248 | 10494 |
| K | Kg | 812 | 7.80 | 6334 | 15644 |
| Plant protection | Per Yr | | 1080.00 | 28080 | 69358 |
| Land rent | Per Yr | | 2480.00 | 64480 | 159266 |
| Miscellaneous charges | Per Yr | | 605.00 | 15730 | 38853 |
| Water rates etc | Per Yr | | 82.00 | 2132 | 5266 |
| | Years 13 to 40 total | | | 399400 | 986517 |
| | Present Worth | | | 31132 | 76896 |
| | Present Worth of Total Cost | | | 84912 | 209732 |
| | Net Present Worth | | | 13022 | 32165 |
| | Net Present Worth/Year | | | 326 | 804 |

Source: Prepared in consultation with the Staff, Department of Horticulture, University of Agriculture, Faisalabad, and Government of Punjab 1987 (c,x).

# KINNOW ORCHARD

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| *Output* | | Per Ac | Per Ac | Per Ac | Per Ha |
| Year 5 to 10 | Tree | 90 | 168.00 | 90720 | 224078 |
| 350 kinnows/tree/year | | | | | |
| Year 11 to 20 | Tree | 90 | 360.00 | 324000 | 800280 |
| 750 kinnows/tree/year | | | | | |
| Present Value of Output | | | | 98449 | 243170 |
| 12 % Rate of Discount | | | | | |
| | *Per Year Basis* | | | | |
| *Costs* | | | | | |
| | *First Year* | | | | |
| Land preparation | | | | | |
| Ploughing | No | 1 | 50.00 | 50 | 124 |
| Ploughing & planking | No | 2 | 70.00 | 140 | 346 |
| Layout for plants | Day | 2 | 36.00 | 72 | 178 |
| Digging,planting & fil'ng | Day | 16 | 36.00 | 576 | 1423 |
| Manure (incl. carriage) | Tons | 12 | 125.00 | 1500 | 3705 |
| Citrus plants | | 90 | 5.00 | 450 | 1112 |
| Silt | Tons | 12 | 25.00 | 300 | 741 |
| Care of plants | Month | 12 | 300.00 | 3600 | 8892 |
| Hedges 7 windbreaks | Day | 8 | 36.00 | 288 | 711 |
| Water rates etc | | | 82.00 | 82 | 203 |
| | First Year Total | | | 7058 | 17433 |
| | *Years 2 to 5* | | | | |
| Care of plants | Month | 48 | 300.00 | 14400 | 35568 |
| Replacement @ 10% | Plant | 9 | 5.00 | 45 | 111 |
| Interculture - ploughing | No | 24 | 50.00 | 1200 | 2964 |
| Hoeing | Day | 40 | 36.00 | 1440 | 3557 |
| Manure (incl. carriage) | Tons | 33 | 125.00 | 4125 | 10189 |
| Fertilizer (N) | Kg | 86 | 9.13 | 785 | 1939 |
| Plant protection | Per Yr | | 324.00 | 1296 | 3201 |
| Land rent | Per Yr | | 930.00 | 3720 | 9188 |
| Miscellaneous charges | Per Yr | | 363.00 | 1089 | 2690 |
| Water rates etc | Per Yr | | 82.00 | 328 | 810 |
| | Year 2 to 5 total | | | 28428 | 70218 |
| | Present Worth | | | 25827 | 63793 |

**continued on the next page**

## KINNOW ORCHARD - contin'd

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| | | Per Ac | Per Ac | Per Ac | Per Ha |
| | *Years 6 to 10* | | | | |
| Care of plants | Month | 60 | 300.00 | 18000 | 44460 |
| Interculture - ploughing | No | 30 | 50.00 | 1500 | 3705 |
| Hoeing | Day | 40 | 36.00 | 1440 | 3557 |
| Manure (incl. carriage) | Tons | 72 | 125.00 | 9000 | 22230 |
| Fertilizer(s) N | Kg | 418 | 9.13 | 3816 | 9426 |
| P | Kg | 182 | 8.17 | 1487 | 3673 |
| K | Kg | 225 | 7.80 | 1755 | 4335 |
| Plant protection | Per Yr | | 1080.00 | 5400 | 13338 |
| Land rent | Per Yr | | 1860.00 | 9300 | 22971 |
| Miscellaneous charges | Per Yr | | 484.00 | 2420 | 5977 |
| Water rates etc | Per Yr | | 82.00 | 410 | 1013 |
| | Years 6 to 10 total | | | 54528 | 134685 |
| | Present Worth | | | 22307 | 55098 |
| | *Years 11 to 20* | | | | |
| Care of plants | Month | 120 | 300.00 | 36000 | 88920 |
| Interculture - ploughing | No | 60 | 50.00 | 3000 | 7410 |
| Hoeing | Day | 100 | 36.00 | 3600 | 8892 |
| Manure (incl. carriage) | Tons | 216 | 125.00 | 27000 | 66690 |
| Fertilizer(s) N | Kg | 1242 | 9.13 | 11339 | 28008 |
| P | Kg | 648 | 8.17 | 5294 | 13077 |
| K | Kg | 675 | 7.80 | 5265 | 13005 |
| Plant protection | Per Yr | | 1080.00 | 10800 | 26676 |
| Land rent | Per Yr | | 2480.00 | 24800 | 61256 |
| Miscellaneous charges | Per Yr | | 605.00 | 6050 | 14944 |
| Water rates etc | Per Yr | | 82.00 | 820 | 2025 |
| | Years 11 to 20 total | | | 133969 | 330902 |
| | Present Worth | | | 24372 | 60198 |
| | Present Worth of total Cost | | | 72506 | 179089 |
| | Net Present Worth | | | 25944 | 64081 |
| | Net Present Worth/ Year | | | 1297 | 3204 |

Source: Prepared in consultation with the Staff, Department of Horticulture, University of Agriculture, Faisalabad and Government of Punjab, 1988 (b,w).

## GUAVA ORCHARD

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| *Output* | | Per Ac | Per Ac | Per Ac | Per Ha |
| Year 4 to 10 | Tree | 90 | 10800 | 75600 | 186732 |
| 40 kg/year/tree | | | | | |
| Year 11 to 20 | Tree | 90 | 21600 | 216000 | 533520 |
| 80 kg/year/tree | | | | | |
| Present Value of Output | | | | 74378 | 183713 |
| 12 % Rate of Discount | | | | | |
| *Costs* | | | | | |
| | *Per Year Basis* | | | | |
| | *First Year* | | | | |
| Land preparation | | | | | |
| Ploughing | No | 2 | 50.00 | 100 | 247 |
| Ploughing & planking | No | 1 | 70.00 | 70 | 173 |
| Layout of plants | Day | 2 | 36.00 | 72 | 178 |
| Digging,planting & fil'ng | Day | 12 | 36.00 | 432 | 1067 |
| Manure (incl. carriage) | Tons | 12 | 125.00 | 1500 | 3705 |
| Guava plants | | 90 | 3.00 | 270 | 667 |
| Silt | Tons | 12 | 12.00 | 144 | 356 |
| Care of plants | Month | 12 | 300.00 | 3600 | 8892 |
| Water rates etc | | | 82.00 | 82 | 203 |
| | First Year Total | | | 6270 | 15487 |
| | *Years 2 to 5* | | | | |
| Care of plants | Month | 48 | 300.00 | 14400 | 35568 |
| Replacement @ 10% | Plant | 9 | 3.00 | 27 | 67 |
| Interculture - ploughing | No | 6 | 50.00 | 300 | 741 |
| Hoeing | Day | 9 | 36.00 | 324 | 800 |
| Manure (incl. carriage) | Tons | 33 | 125.00 | 4125 | 10189 |
| Fertilizer (N) | Kg | 249 | 9.13 | 2273 | 5615 |
| P | Kg | 115 | 8.17 | 940 | 2321 |
| K | Kg | 135 | 7.80 | 1053 | 2601 |
| Plant protection | Per Yr | | 810.00 | 3240 | 8003 |
| Land rent | Per Yr | | 620.00 | 2480 | 6126 |
| Miscellaneous charges | Per Yr | | 363.00 | 1452 | 3586 |
| Water rates etc | Per Yr | | 82.00 | 328 | 810 |
| | Year 2 to 5 total | | | 30942 | 76427 |
| | Present Worth | | | 26579 | 65651 |

**continued on the next page**

## GUAVA ORCHARD - contin'd

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| | | Per Ac | Per Ac | Per Ac | Per Ha |
| | *Years 6 to 20* | | | | |
| Care of plants | Month | 180 | 300.00 | 54000 | 133380 |
| Interculture - ploughing | No | 30 | 50.00 | 1500 | 3705 |
| Hoeing | Day | 34 | 36.00 | 1224 | 3023 |
| Manure (incl. carriage) | Tons | 95 | 125.00 | 11875 | 29331 |
| Fertilizer (N) | Kg | 1397 | 9.13 | 12755 | 31504 |
| P | Kg | 648 | 8.17 | 5294 | 13077 |
| K | Kg | 762 | 7.80 | 5944 | 14681 |
| Plant protection | Per Yr | | 540.00 | 8100 | 20007 |
| Land rent | Per Yr | | 2480.00 | 37200 | 91884 |
| Miscellaneous charges | Per Yr | | 605.00 | 9075 | 22415 |
| Water rates etc | Per Yr | | 82.00 | 1230 | 3038 |
| | Years 6 to 20 total | | | 148196 | 366045 |
| | Present Worth | | | 38182 | 94309 |
| | Present Worth of total Cost | | | 64761 | 159961 |
| | Net Present Worth | | | 9616 | 23752 |
| | Net Present Worth/ Year | | | 481 | 1188 |

Source: Prepared in consultation with the staff, Department of Horticulture, University of Agriculture, Faisalabad and Government of Punjab, (v).

## BERSEEM (Irrigated)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Produce | 40 Kg | 800 | 8.00 | 6400 | 15808 |
| *Output* | | | | 6400 | 15808 |
| *Costs* | | | | | |
| Ploughing | No | 1 | 50.00 | 50 | 124 |
| Ploughing & planking | No | 3 | 70.00 | 210 | 519 |
| Planting | No | 1 | 50.00 | 50 | 124 |
| Seed | Kg | 8 | 30.00 | 240 | 593 |
| Fertilzer(s) | | | | | |
| N | Kg | 35 | 9.13 | 320 | 789 |
| Manure | 40 Kg | 125 | 5.00 | 625 | 1544 |
| Transport | 40 Kg | 125 | 0.20 | 25 | 62 |
| Labor | Day | 1 | 36.00 | 36 | 89 |
| Irrigation | | | | | |
| Tubewell | Hr | 2 | 35.00 | 70 | 173 |
| Labor | Hr | 32 | 4.50 | 144 | 356 |
| Harvesting | Day | 60 | 36.00 | 2160 | 5335 |
| Interest @ 12.5% per annum (for 6 months) | | | | 111 | 273 |
| Labor (additional) | Hr | 9.5 | 4.50 | 43 | 106 |
| Cleaning channels | Hr | 2 | 4.50 | 9 | 22 |
| Land rent (for 6 months) | | | 1240.00 | 1240 | 3063 |
| | *Variable Costs* | | | 4040 | 9979 |
| | *Total Cost* | | | 5332 | 13170 |
| Gross Margin | (Rs) | | | 2360 | 5829 |
| Net Income without rent | (Rs) | | | 2308 | 5701 |
| Net Income with rent | (Rs) | | | 1068 | 2638 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 52 | |
| Working Capital | (%) | | | 63 | |
| Investment in Land (@ Rs 90,000/Ac) | (%) | | | 1 | |

Source: Chaudhry and Ahmad 1982 (b), 1986 (b), Livestock Production Research Institute, 1989 (c).

# MAIZE FODDER [IRRIGATED (Kharif)]

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Produce | 40 Kg | 390 | 8.00 | 3120 | 7706 |
| *Output* | | | | 3120 | 7706 |
| *Costs* | | | | | |
| Ploughing | No | 1 | 50.00 | 50 | 124 |
| Ploughing & planking | No | 3 | 70.00 | 210 | 519 |
| Sowing | | | 50.00 | 50 | 124 |
| Seed | Kg | 40 | 3.00 | 120 | 296 |
| Fertilzer(s) | | | | | |
| N | Kg | 20 | 9.13 | 183 | 451 |
| Manure | 40 Kg | 125 | 5.00 | 625 | 1544 |
| Transport | 40 Kg | 125 | 0.50 | 63 | 154 |
| Labor | Day | 1 | 36.00 | 36 | 89 |
| Irrigation | | | | | |
| Tubewell | Hr | 2 | 35.00 | 70 | 173 |
| Labor | Hr | 8 | 4.50 | 36 | 89 |
| Harvesting | Day | 20 | 36.00 | 720 | 1778 |
| Interest @ 12.5% per annum (for 6 months) | | | | 90 | 223 |
| Labor (additional) | Hr | 9.5 | 4.50 | 43 | 106 |
| Cleaning channels | Hr | 2 | 4.50 | 9 | 22 |
| Land rent (for 6 months) | | | 1240.00 | 1240 | 3063 |
| Water Rates | Rs. | | 25.00 | 25 | 62 |
| | *Variable Costs* | | | 2252 | 5563 |
| | *Total Cost* | | | 3569 | 8815 |
| Gross Margin | (Rs) | | | 868 | 2143 |
| Net Income without rent | (Rs) | | | 791 | 1954 |
| Net Income with rent | (Rs) | | | -449 | -1109 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 24 | |
| Working Capital | (%) | | | -23 | |
| Investment in Land (@ Rs 90,000/Ac) | (%) | | | 1 | |

Source: Chaudhry and Ahmad 1982 (b), 1986 (b), Livestock Production Research Institute, 1989 (c).

## SADABAHAR (Irrigated)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) | |
|---|---|---|---|---|---|
| Yield | | Per Ac | | Per Ac | Per Ha |
| Produce | 40 Kg | 1250.0 | 6.00 | 7500 | 18525 |
| *Output* | | | | 7500 | 18525 |
| *Costs* | | | | | |
| Ploughing - soil inverter | No | 1.0 | 50.00 | 50 | 124 |
| -cultivator | No | 3.0 | 30.00 | 90 | 222 |
| Planking | No | 3.0 | 15.00 | 45 | 111 |
| Seed | Kg | 10.0 | 60.00 | 600 | 1482 |
| F.Y.M. - cart load | Tons | 15.0 | 26.88 | 403 | 996 |
| Transport | | | 213.70 | 214 | 528 |
| Spreading etc | Day | 3.3 | 30.00 | 98 | 242 |
| Fertilizer(s) | | | | | |
| Urea | Bag | 4.0 | 137.16 | 549 | 1355 |
| Application | Day | 0.5 | 30.00 | 15 | 37 |
| Irrigation | | | | | |
| Clean Water Courses | Day | 1.0 | 30.00 | 30 | 74 |
| Tubewell | No | 2.0 | 57.78 | 116 | 285 |
| Apply irrigation | Day | 2.0 | 30.00 | 60 | 148 |
| Harvesting | Day | 90.1 | 30.00 | 2702 | 6673 |
| Interest - @ 12%, 1/2 yr | | | | 204 | 504 |
| Labor | Day | | 35.00 | | |
| Land rent | | | 1209.38 | 1209 | 2987 |
| Water Rates | | | 25.00 | 25 | 62 |
| | *Variable Costs* | | | 5175 | 12781 |
| | *Total Cost* | | | 6409 | 15830 |
| Gross Margin | (Rs) | | | | |
| Net Income | (Rs) | | | 1091 | 2695 |
| Return to: | | | | | |
| Labor | (Rs/day) | | | 42 | 104 |
| Working Capital | (%) | | | 57 | |
| Fixed Capital | (%) | | | 2 | |
| (Land Rs100,000/Ha) | | | | | |

Source: Livestock Production Research Institute, 1989 (c).

## NILI RAVI BUFFALO
## (Per Buffalo Per Year)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) |
|---|---|---|---|---|
| Produce | | | | |
| Milk | Litres | 2200 | 5 | 11000 |
| Calf | Hd | 0.35 | 800 | 280 |
| Heifer | Hd | 0.26 | 2500 | 650 |
| Culls | Hd | 0.07 | 7000 | 490 |
| Manure | 40 Kg | 180 | 5 | 900 |
| *Output* | | | | 13320 |
| *Costs* | | | | |
| Fodder | | | | |
| Green | 40 Kg | 480 | 8 | 3840 |
| Dry | 40 Kg | 90 | 12 | 1080 |
| Concentrate | 40 Kg | 25 | 100 | 2500 |
| Vet. & medicine | | | 100 | 100 |
| Bull service charge | | | 50 | 50 |
| Replacement @ 12% | Hd | 0.12 | 18000 | 2160 |
| Interest @ 12.5% per annum of average value | | | | 1563 |
| Labor | Days | 90 | 36 | 3240 |
| Equipment costs | | | 192 | 192 |
| Interest on shed & space + depreciation on shed | | | 460 | 460 |
| | *Variable Costs* | | | 11311 |
| | *Total Cost* | | | 15184 |
| Gross Margin/Hd | (Rs) | | | 2010 |
| Net Income/Hd | (Rs) | | | -1864 |
| Return to: | | | | |
| Labor | (Rs/day) | | | 15 |
| Feed Cost | (%) | | | 75 |
| Livestock capital | (%) | | | -15 |

Source: Chaudhry and Ahmad (1987), Livestock Production Institute 1989, (e). Prepared in consultation with Professor S.H Hanjra, Department of Livestock Management, University of Agriculture, Faisalabad.

Main Assumptions: Female replacement 12%, reproductive rate 72%, mortality rate youngstock 10%, adults 5%.

Note: There is wide variation in milk prices. Near major cities prices may reach Rs. 10.00 /kg, in villages far from cities the prices are Rs. 4.00 /kg.

# AVERAGE MILKING BUFFALO
## (Per Buffalo Per Year)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) |
|---|---|---|---|---|
| Produce | | | | |
| Milk | Litres | 1400 | 5 | 7000 |
| Calf | Hd | 0.24 | 550 | 132 |
| Heifer | Hd | 0.22 | 2100 | 462 |
| Culls | Hd | 0.05 | 6000 | 300 |
| Manure | 40 Kg | 120 | 5 | 600 |
| *Output* | | | | 8494 |
| *Costs* | | | | |
| Fodder | | | | |
| Green | 40 Kg | 300 | 8 | 2400 |
| Dry | 40 Kg | 45 | 12 | 540 |
| Concentrate | 40 Kg | 8 | 100 | 800 |
| Vet. & medicine | | | 25 | 25 |
| Bull service charge | | | 50 | 50 |
| Replacement @ 12% | Hd | 0.12 | 13000 | 1560 |
| Interest @ 12.5% per annum of average value | | | | 1188 |
| Labor | Days | 70 | 36 | 2520 |
| Equipment costs | | | 128 | 128 |
| Interest & depreciation on shed space | | | 222 | 222 |
| | *Variable Costs* | | | 7823 |
| | *Total Cost* | | | 9433 |
| Gross Margin/Hd | (Rs) | | | 672 |
| Net Income/Hd | (Rs) | | | -939 |
| Return to: | | | | |
| Labor | (Rs/day) | | | 23 |
| Feed Cost | (%) | | | 75 |
| Livestock capital | (%) | | | -10 |

Source: Chaudhry and Ahmad 1987 (a,c). Prepared in consultation with Professor S.H. Hanjra, Department of Livestock Management, University of Agriculture, Faisalabad.

Main Assumptions: Female replacement 12%, reproductive rate 52 %, mortality rate: youngstock 20 %, adults 7 %

## SAHIWAL COW
## (Per Cow Per Year)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) |
|---|---|---|---|---|
| Produce | | | | |
| Milk | Litres | 2250 | 4.5 | 10125 |
| Calf | Hd | 0.39 | 700 | 273 |
| Heifer | Hd | 0.29 | 2400 | 696 |
| Culls | Hd | 0.07 | 6000 | 420 |
| Manure | 40 Kg | 160 | 5 | 800 |
| *Output* | | | | 12314 |
| *Costs* | | | | |
| Fodder | | | | |
| Green | 40 Kg | 420 | 8 | 3360 |
| Dry | 40 Kg | 90 | 12 | 1080 |
| Concentrate | 40 Kg | 25 | 100 | 2500 |
| Vet. & medicine | | | 100 | 100 |
| Bull service charge | | | 50 | 50 |
| Replacement @ 12% | Hd | 0.12 | 14000 | 1680 |
| Interest @ 12.5% per annum of average value | | | | 1250 |
| Labor | Days | 80 | 36 | 2880 |
| Equipment costs | | | 192 | 192 |
| Interest on shed & space + depreciation on shed | | | 375 | 375 |
| | *Variable Costs* | | | 11460 |
| | *Total Cost* | | | 13467 |
| Gross Margin/Hd | (Rs) | | | 854 |
| Net Income/Hd | (Rs) | | | -1153 |
| Return to: | | | | |
| Labor | (Rs/day) | | | 22 |
| Feed Cost | (%) | | | 83 |
| Livestock capital | (%) | | | 1 |

Source: Chaudhry and Ahmad (1987), Livestock Production Institute 1989, (e). Prepared in consultation with Professor S.H Hanjra, Department of Livestock Management, University of Agriculture, Faisalabad.

Main Assumptions: Female replacement 12%, reproductive rate 80%, mortality rate youngstock 10%, adults 5%.

Note: There is wide variation in milk prices. Near major cities prices may reach Rs. 10.00 /kg, in villages far from cities the prices are Rs. 4.00 /kg.

## AVERAGE MILKING COW
## (Per Cow Per Year)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) |
|---|---|---|---|---|
| Produce | | | | |
| Milk | Litres | 860 | 4.5 | 3870 |
| Calf | Hd | 0.31 | 450 | 140 |
| Heifer | Hd | 0.25 | 2500 | 625 |
| Culls | Hd | 0.07 | 4000 | 280 |
| Manure | 40 Kg | 80 | 5 | 400 |
| *Output* | | | | 5315 |
| *Costs* | | | | |
| Fodder | | | | |
| Green | 40 Kg | 130 | 8 | 1040 |
| Dry | 40 Kg | 20 | 12 | 240 |
| Concentrate | 40 Kg | 4.5 | 100 | 450 |
| Vet. & medicine | | | 30 | 30 |
| Bull service charge | | | 30 | 30 |
| Replacement @ 12% | Hd | 0.12 | 8000 | 960 |
| Interest @ 12.5% per annum of average value | | | | 750 |
| Labor | Days | 60 | 36 | 2160 |
| Equipment costs | | | 128 | 128 |
| Interest on shed & space + depreciation on shed | | | 167 | 167 |
| | *Variable* | *Costs* | | 4580 |
| | *Total* | *Cost* | | 5955 |
| Gross Margin/Hd | (Rs) | | | 735 |
| Net Income/Hd | (Rs) | | | -641 |
| Return to: | | | | |
| Labor | (Rs/day) | | | 25 |
| Feed Cost | (%) | | | 63 |
| Livestock capital | (%) | | | -11 |

Source: Chaudhry and Ahmad 1987 (a,c). Prepared in consultation with Professor S.H. Hanjra, Department of Livestock Management, University of Agriculture, Faisalabad.

Main Assumptions: Female replacement 12%, reproductive rate 52 %, mortality rate: youngstock 20 %, adults 7 %

# BEEF CATTLE
## (Per Head Per Year)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) |
|---|---|---|---|---|
| Produce | | | | |
| 12 month old animal | | | 2500 | 2500 |
| Manure | 40 Kg | 40 | 5 | 200 |
| *Output* | | | | 2700 |
| *Costs* | | | | |
| Fodder | | | | |
| Green | 40 Kg | 140 | 8 | 1120 |
| Dry Fodder | 40 Kg | 70 | 12 | 840 |
| Vet. & medicine | | | 22 | 22 |
| Calf | | | 730 | 730 |
| Interest @ 12.5% per annum on average value | | | | 202 |
| Labor | Days | 29 | 36 | 1044 |
| Equipment costs | | | 96 | 96 |
| Interest on shed & space + depreciation on shed | | | 111 | 111 |
| | *Variable Costs* | | | 3436 |
| | *Total Cost* | | | 4165 |
| Gross Margin/Hd | (Rs) | | | -736 |
| Net Income/Hd | (Rs) | | | -1465 |
| Return to: | | | | |
| Labor | (Rs/day) | | | -15 |
| Feed Cost | (%) | | | 25 |
| Livestock capital | (%) | | | -346 |

Source: Prepared in consultation with Professor S.H. Hanjra, Department of Livestock Management, University of Agriculture, Faisalabad.

## MEAT BUFFALO
## (Per Head Per Year)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) |
|---|---|---|---|---|
| Produce | | | | |
| 12 months old animal | | | 2600 | 2600 |
| Manure | 40 Kg | 45 | 5 | 225 |
| *Output* | | | | 2825 |
| *Costs* | | | | |
| Fodder | | | | |
| Green | 40 Kg | 155 | 8 | 1240 |
| Dry Fodder | 40 Kg | 75 | 12 | 900 |
| Vet. & medicine | | | 22 | 22 |
| Calf | | | 840 | 840 |
| Interest @ 12.5% per annum on average value | | | | 215 |
| Labor | Days | 20 | 36 | 720 |
| Equipment costs | | | 96 | 96 |
| Interest on shed & space + depreciation on shed | | | 111 | 111 |
| | *Variable Costs* | | | 3577 |
| | *Total Cost* | | | 4144 |
| Gross Margin/Hd | (Rs) | | | -752 |
| Net Income/Hd | (Rs) | | | -1319 |
| Return to: | | | | |
| Labor | (Rs/day) | | | -30 |
| Feed Cost | (%) | | | 38 |
| Livestock capital | (%) | | | -64 |

Source: Prepared in consultation with Professor S.H. Hanjra, Department of Livestock Management, University of Agriculture, Faisalabad.

# SHEEP
## (Per Head Per Year)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) |
|---|---|---|---|---|
| Produce | | | | |
| Wool | Kg | 1.3 | 32 | 40 |
| Youngstock | Hd | 0.97 | 450 | 437 |
| Culls | Hd | 0.09 | 400 | 36 |
| Manure | 40 Kg | 3.8 | 5 | 19 |
| *Output* | | | | 531 |
| *Costs* | | | | |
| Grazing | Ac | 0.06 | 1000 | 60 |
| Vet. & medicine | | | 3 | 3 |
| Ram service charge | | | 10 | 10 |
| Replacement @ 15% | Hd | 0.15 | 600 | 90 |
| Miscellaneous | | | 15 | 15 |
| Interest @ 12.5% per annum on average value | | | 63 | 63 |
| Labor for grazing | Day | 9 | 36 | 324 |
| Interest on shed & space + depreciation on shed | | | 24 | 24 |
| | *Variable Costs* | | | 403 |
| | *Total Cost* | | | 589 |
| Gross Margin/Hd | (Rs) | | | 129 |
| Net Income/Hd | (Rs) | | | -57 |
| Return to: | | | | |
| Labor | (Rs/day) | | | 30 |
| Feed Cost | (%) | | | 5 |
| Livestock capital | (%) | | | 1 |

Source: Prepared in consultation with Professor S.H. Hanjra, Department of Livestock Management, University of Agriculture, Faisalabad.

Main Assumptions: Female replacement 15%, Lambing rate per annum 114 % mortality rate: youngstock 10 %, adults 6 %. One shepherd manages 45 ewes.

## BEETAL GOAT
## (Per Head Per Year)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) |
|---|---|---|---|---|
| Produce | | | | |
| Milk | Kg | 40 | 4 | 160 |
| Youngstock | Hd | 1.7 | 800 | 1368 |
| Culls | Hd | 0.1 | 1200 | 120 |
| Manure | 40 Kg | 4 | 5 | 20 |
| *Output* | | | | 1508 |
| *Costs* | | | | |
| Grazing | Ac | 0.1 | 200 | 20 |
| Green fodder | 40 Kg | 20 | 4 | 80 |
| Vet. & medicine | | | 3 | 3 |
| Buck service charge | | | 28 | 28 |
| Replacement @ 30% | Hd | 0.3 | 800 | 240 |
| Micellaneous | | | 15 | 15 |
| Interest @ 12.5% per annum of average value | | | | 125 |
| Labor for grazing | Day | 8 | 36 | 288 |
| General labor | Day | 9 | 36 | 324 |
| Interest on shed & space + depreciation on shed | | | 24 | 24 |
| | *Variable Costs* | | | 511 |
| | *Total Cost* | | | 1147 |
| Gross Margin/Hd | (Rs) | | | 997 |
| Net Income/Hd | (Rs) | | | 361 |
| Return to: | | | | |
| Labor | (Rs/day) | | | 57 |
| Feed Cost | (%) | | | 461 |
| Livestock Capital | (%) | | | 36 |

Source: Livestock Production Research Institute 1989 (a).
Prepared in consultation with Professor S.H. Hanjra, Department of Livestock Management, University of Agriculture, Faisalabad.

Main Assumptions: Female replacement 15%, kidding rate per annum 200 % mortality rate: youngstock 10 %, adults 5 %. Two shepherd manage 45 ewes.

# TEDDY GOAT
## (Per Head Per Year)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) |
|---|---|---|---|---|
| Produce | | | | |
| Youngstock | Hd | 2.18 | 320 | 698 |
| Culls | Hd | 0.28 | 320 | 90 |
| Manure | 40 Kg | 2.5 | 5 | 13 |
| *Output* | | | | 800 |
| *Costs* | | | | |
| Fodder | 40 Kg | 45 | 4 | 180 |
| Vet. & medicine | | | 3 | 3 |
| Buck service charge | | | 28 | 28 |
| Replacement @ 30% | Hd | 0.30 | 400 | 120 |
| Miscellaneous | | | 15 | 15 |
| Interest @ 12.5% per annum of average value | | | | 45 |
| Labor | Day | 9 | 36 | 324 |
| Interest on shed & space + depreciation on shed | | | 24 | 24 |
| | *Variable Costs* | | | 553 |
| | *Total Cost* | | | 739 |
| Gross Margin/Hd | (Rs) | | | 247 |
| Net Income/Hd | (Rs) | | | 60 |
| Return to: | | | | |
| Labor | (Rs/day) | | | 43 |
| Feed Cost | (%) | | | 133 |
| Livestock Capital | (%) | | | 17 |

Source: Livestock Production Research Institute 1988 (b).
Prepared in consultation with Professor S.H. Hanjra, Department of Livestock Management, University of Agriculture, Faisalabad.

Main Assumptions: Female replacement 30%, kidding rate per annum 290 % mortality rate: suckling kids 15 %, youngstock 10 %, adults 2 %.

# BROILERS
## (1000 Broilers Kept for 50 Days)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) |
|---|---|---|---|---|
| Produce | | | | |
| Birds marketed (live weight) | Kg | 1400 | 27 | 37800 |
| Empty feed bags | No | 65 | 2 | 130 |
| Litter | Truck | 0.2 | 474 | 71 |
| *Output* | | | | 38001 |
| *Costs* | | | | |
| Day old chicks | No | 1000 | 12 | 12000 |
| Feed no IV | Bag | 25 | 286 | 7150 |
| Feed no V | Bag | 40 | 281 | 11240 |
| Glucose/maize | | | 48 | 48 |
| Vaccination etc | | | 232 | 232 |
| Fuel | | | 488 | 488 |
| Brooding | | | 678 | 678 |
| Miscellaneous (med. & litter) | | | 1210 | 1210 |
| Interest @ 12.5% per annum for 50 days | | | | 573 |
| Labor | | | 866 | 866 |
| Depreciation on buildings & equipment | | | 1434 | 1434 |
| | *Variable Costs* | | | 34052 |
| | *Total Cost* | | | 35919 |
| | Prod'n cost/kg live wt | | | 26 |
| Gross Margin | (Rs) | | | 3949 |
| Net Income | (Rs) | | | 2082 |
| Net Income/Kg live weight | (Rs) | | | 1 |
| Return to: | | | | |
| Labor | (Rs/day) | | | 119 |
| Working Capital | (%) | | | 8 |
| Fixed Capital | (%) | | | 2 |

Source: Economic Analysis Network (1987). Prices update in line with recent market prices or cost indexed.

- Variable costs include the cost of item such as day old chicks, layer' ration vaccination, rice husk, fuel/electricity, interest and 50% of labour.
- Interest calculations include variable costs and average value of birds.

# EGG PRODUCTION
## (1000 Layer kept for 60 weeks)

| Particulars | Unit | Quantity | Rate (Rs) | Amount (Rs) |
|---|---|---|---|---|
| Produce | | | | |
| Eggs (360 per crate) | Crates | 685 | 423 | 289755 |
| Culled birds | No | 850 | 30 | 25500 |
| Poultry manure | Truck | 2 | 305 | 644 |
| Empty feed bags | No | 510 | 2.9 | 1479 |
| *Output* | | | | 317378 |
| *Costs* | | | | |
| Day old chicks | No | 1000 | 15 | 14600 |
| Layer's ration | Bags | 700 | 225 | 157500 |
| Vaccination @ Rs 3.2/bird | | | 3.2 | 3200 |
| Rice husk @ Rs 2.0/bird | | | 2.0 | 2000 |
| Fuel/electricty @ Rs 6.6/bird | | | 6.6 | 6600 |
| Interest @ 12.5% per year incl. Average value of birds | | | | 28154 |
| Labor @ Rs 11.7/bird | | | 11.7 | 11700 |
| Rent @ Rs 7.9/bird | | | 7.9 | 7900 |
| Depreciation @ Rs 3.2/bird | | | 3.2 | 3200 |
| | *Variable Costs* | | | 217904 |
| | *Total Cost* | | | 234854 |
| | Production cost/crate | | | 343 |
| Gross Margin | (Rs) | | | 99474 |
| Net Income | (Rs) | | | 82524 |
| Net Income/crate of eggs | (Rs) | | | 120 |
| Returns to: | | | | |
| Labor | (Rs/day) | | | 282 |
| Working Capital | (%) | | | 50 |
| Fixed Capital | (%) | | | 133 |

Source: Economic Analysis Network (1987). Prices update in line with recent market prices or cost indexed.

- Variable costs include the cost of item such as day old chicks, layer's ration vaccination, rice husk, fuel/electricity, interest and 50% of labour.
- Interest calculations include variable costs and average value of birds.

# Enterprise Labor Requirements by Operation and Crop

## Labor Requirements for Main Rabi Crops (Per Acre)

| Operation | Time Taken Per Operation | Crop | | | | | |
|---|---|---|---|---|---|---|---|
| | | Wheat in Rice based Cropping System | Wheat in Cotton based Cropping System | Barani Wheat | Rapeseed & Mustard Irrig. | Sun-flower Irrig. | Saf-flower Irrig. |
| | | Hours | | | | | |
| Cleaning Channels | 2 | 2 | 2 | | 2 | 2 | 2 |
| Deep Ploughing | 2 | | 0.1 | 0.1 | | | |
| Ploughing | 0.5 | 2 | 1.5 | 1 | 1 | 0.5 | 0.5 |
| Ploughing & Planking | 0.5 | 1 | 1 | 1 | 1.5 | 1 | 1 |
| Drill Seed | 0.5 | | | 0.5 | | | |
| Broadcast Seed | 2 | 2 | 2 | | 1 | 2 | 2 |
| Broadcast Fertilizer | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Canal Irrigation | 2 | 4 | 4 | | 2 | 4 | 6 |
| Tubewell Irrigation | 2 | 6 | 6 | | 2 | 4 | 2 |
| Hand Weeding | | | | | | 48 | 48 |
| Fodder Cutting | | | | 32 | | | |
| Harvesting | | 32 | 32 | 26 | 32 | 32 | 32 |
| Threshing | | 6 | 6 | 4 | 8 | 32 | 32 |
| Winnowing | 8 | | | | 16 | | |
| Stacking Straw | | 8 | 8 | 6 | | | |
| Misc. Labor | | 9 | 9 | 5 | 3.5 | 2.5 | 2.5 |
| Total | | 73 | 73 | 77 | 70 | 129 | 129 |

## Labor Requirements for Main Kharif Crops (Per Acre)

| Operation | Time Taken Per Operation | Crop: Basmat Rice 370 | Basmat Rice 385 | IRRI Rice | Irrig. Maize Kharif | Irrig. Maize Spring | Barani Maize Kharif |
|---|---|---|---|---|---|---|---|
| | | | | Hours | | | |
| Cleaning Channels | 2 | 4 | 4 | 4 | 2 | 2 | |
| Ploughing | 0.5 | | | | 1.5 | | 0.5 |
| Ploughing & Planking | 0.5 | 0.5 | 0.5 | 0.5 | 1.5 | 2 | 1 |
| Puddling | 2.5 | 10 | 10 | 10 | | | |
| Puddling & Planking | 3 | 9 | 9 | 9 | | | |
| Raising Nursery | 4 | 4 | 4 | 4 | | | |
| Transplanting | 60 | 60 | 60 | 60 | | | |
| Broadcast Seed | 2 | | | | 2 | 2 | 2 |
| Broadcast Fertilizer | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Pesticide | 0.5 | 0.5 | 0.5 | 0.5 | | | |
| Apply manure | 8 | 1 | 1 | | 8 | 8 | 6 |
| Canal Irrigation | 2 | 12 | 12 | 12 | 12 | 14 | |
| Tubewell Irrigation | 2 | 20 | 16 | 16 | 4.5 | 2 | |
| Hand Weeding (Interculture) | 16 | 16 | 16 | 16 | 48 | 48 | 48 |
| Seeling | 2 | | | | | | 2 |
| Thinning | 16 | | | | 16 | 16 | 16 |
| Harvesting | 32 | | | | 32 | 32 | 24 |
| /Dehusking | 16 | | | | 16 | 16 | 16 |
| /Shelling | 4 | | | | 4 | 4 | 2 |
| /Threshing & Cleaning | 64 | 64 | 64 | 64 | | | |
| Stacking Straw | 3 | 3 | 3 | 3 | | | |
| Misc. Labor | | 8.5 | 8.5 | 8.5 | 2.5 | 2.5 | 4.5 |
| Total | | 213 | 209 | 208 | 151 | 149 | 123 |

## Labor Requirements for Rabi Pulses & Oilseeds (Per Acre)

| Operation | Time Taken Per Operation | Crop: Lentils Barani | Crop: Gram (Chickpeas) Barani | Crop: Canola Barani |
|---|---|---|---|---|
| | | Hours | | |
| Cleaning Channels | 2 | | | |
| Deep Ploughing | 2 | | | 2 |
| Ploughing | 0.5 | 0.5 | 0.5 | 2 |
| Ploughing & Planking | 0.5 | 1 | 1 | 2 |
| Broadcast Seed | 2 | 2 | 2 | 2 |
| Broadcast Fertilizer | 0.5 | | | 1 |
| Canal Irrigation | 2 | | | |
| Tubewell Irrigation | 2 | | | |
| Hand Weeding (Interculture) | 16 | 16 | 16 | |
| Harvesting | | 32 | 32 | 40 |
| Threshing | | 4 | 8 | 10 |
| Winnowing & Drying | | 4 | 8 | 20 |
| Misc. Labor | | 2 | 2.5 | 3.5 |
| Total | | 62 | 70 | 83 |

## Labor Requirements for Kharif Pulses & Oilseeds (Per Acre)

| Operation | Time Taken Per Operation | Crop | | | |
|---|---|---|---|---|---|
| | | Groundnuts Barani | Soyabeans Irrig. | Mung Barani | Mash Barani |
| | | Hours | | | |
| Cleaning Channels | 2 | | 2 | | |
| Deep Ploughing | 1 | 1 | | | |
| Ploughing | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Ploughing & Planking | 0.5 | 1 | 1 | 0.5 | 1 |
| Sowing | 8 | 8 | | | |
| Broadcast Seed | 2 | | 2 | 2 | 2 |
| Broadcast Fertilizer | 0.5 | 0.5 | 0.5 | | |
| Irrigation | | | | | |
| Canal | 2 | | 6 | | |
| Tubewell | 2 | | 2 | | |
| Hoeing & Weeding | | 8 | | 16 | 16 |
| Digging | | 40 | | | |
| Harvesting | | 96 | 32 | 32 | 32 |
| Threshing | | | 32 | 4 | 4 |
| Drying/ Winnowing | | 40 | 16 | 4 | 4 |
| Misc. Labor | | 9.5 | 2.5 | 2.5 | 2.5 |
| Total | | 205 | 97 | 62 | 62 |

## Labor Requirements for Cash Crops (Per Acre)

| Operation | Time Taken Per Operation | Crop | | | |
|---|---|---|---|---|---|
| | | Sugarcane Fresh | Sugarcane Ratoon | Seed Cotton in Cotton Based Crop. System | Seed Cotton in Mixed Crop. Sys. |
| | | Hours | | | |
| Cleaning Channels | 2 | 4 | 4 | 2 | 2 |
| Ploughing | 0.5 | | | 2.5 | 2.5 |
| Ploughing & Planking | 0.5 | 3.5 | | 0.5 | 0.5 |
| Planking | 0.5 | 0.5 | | | |
| Planking & Levelling | 1 | 6 | | 2 | 2 |
| Sowing of Sets | 8 | 72 | | | |
| Broadcast Fertilizer | 1 | 3.5 | 2 | 1.5 | 1.5 |
| Apply manure | | 12 | | 8 | 8 |
| Plant Protection | 8 | | | 8 | 8 |
| Irrigation | | | | | |
| Canal | 2 | 24 | 18 | 6 | 4 |
| Tubewell | 2 | 12 | 10 | 14 | 16 |
| Hoeing | | 32 | | | |
| Hoeing & Th'ing | | | | 24 | 24 |
| Inter-ploughing | | 12 | 12 | 6 | 6 |
| Harvesting | | 192 | 144 | | |
| Transport | | 16 | 16 | | |
| Picking & Harvesting | | | | 96 | 96 |
| Misc. Labor | | 25.6 | 16 | 6.5 | 6.5 |
| Total | | 415 | 222 | 177 | 177 |

## Labor Requirements for Vegetable Crops (Per Acre)

| Operation | Time Taken Per Operation | Crop | | | | | |
|---|---|---|---|---|---|---|---|
| | | Onion | Potatoes (Autumn Crop) | Tomatoes | Chillies | Musk Melon | Water Melon |
| | | Hours | | | | | |
| Cleaning Channels | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Furrow turning | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| Ploughing | 0.5 | 0.5 | 0.5 | | | | |
| Ploughing & Planking | 0.5 | 1 | 2 | 1.5 | 1.5 | 2 | 2 |
| Nursery - care | | 32 | | 16 | | | |
| Sowing | 8 | 160 | 96 | 128 | 80 | 96 | 96 |
| Broadcast Fertilizer | 1 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| FYM Spreading | 8 | 12 | 16 | 12 | 32 | 6 | 8 |
| Irrigation | | | | | | | |
| Canal | 2 | 6 | 12 | 8 | 8 | 4 | 4 |
| Tubewell | 2 | 2 | 4 | 4 | 8 | 4 | 4 |
| Interculture | | 160 | 160 | 240 | 192 | 80 | 80 |
| Picking & Harvesting | | 160 | 192 | 200 | 160 | 80 | 80 |
| Transport | | 14 | 6 | 8 | 6 | 8 | 8 |
| Total | | 553 | 494 | 623 | 493 | 287 | 287 |

## Labor Requirements for Fodder Crops (Per Acre)

| Operation | Time Taken Per Operation | Crop | | |
|---|---|---|---|---|
| | | Maize Fodder Irrig. | Sadabahar Irrig. | Berseem Irrig. |
| | | Hours | | |
| Cleaning Channels | 2 | 2 | 2 | 2 |
| Ploughing | 0.5 | 0.5 | 0.5 | 0.5 |
| Ploughing & Planking | 0.5 | 1.5 | 1.5 | 1.5 |
| Planking | 0.5 | | | 0.5 |
| Planking & Levelling | 1 | 6 | | |
| Sowing of Sets | 8 | 72 | | |
| Broadcast Fertilizer | 1 | 1.5 | 1.5 | 1 |
| Apply manure | 8 | 8 | 8 | 8 |
| Plant Protection | 8 | | | |
| Irrigation | | | | |
| Canal | 2 | 6 | 14 | 30 |
| Tubewell | 2 | 2 | 2 | 2 |
| Harvesting | | 176 | 600 | 480 |
| Misc. Labor | | 9.5 | 9.5 | 9.5 |
| Total | | 285 | 639 | 535 |

## Prices of Farm Machinery and Equipments
## March, 1993

| Item | Price (Rs.) |
|---|---|
| Massey Ferguson-240 50 HP | 2,22,500 |
| Massey Ferguson-375 78 HP | 3,29,500 |
| Fiat-480(s) 48 HP | 2,75,900 |
| Fiat-640 64 HP | 3,60,900 |
| Ford-4610 64 HP | 3,68,000 |
| Belarus MTZ-50 55 HP | 2,38,000 |
| Belarus T-25-A2 27 HP | 1,07,000 |
| Sub Soiler | 5,000-8,000 |
| Chiesel Plough (3-Tine) | 7,000-10,000 |
| Chiesel Plough (5-Tine) | 8,000-11,000 |
| Mould Board Plough (2-Furrow Fixed) | 4,500- 5,500 |
| Mould Board Plough (3-Furrow Fixed) | 6,000-9,500 |
| Disc Plough (2 Discs Fixed) | 16,000-19,500 |
| Disc Plough (3 Discs Fixed) | 20,000-23,000 |
| Cultivator (9-Tine) | 6,500-9,000 |
| Cultivator (11-Tine) | 7,000-10,000 |
| Cultivator (13-Tine) | 8,000-11,000 |
| Disc Harrow (12 Discs) | 17,000-20,000 |
| Disc Harrow (14 Discs) | 20,500-27,000 |
| Disc Harrow (16 Discs) | 22,000-27,000 |
| Disc Harrow (18 Discs) | 23,500-27,500 |
| Fertilizer Spreader/Broadcaster | 8,000-9,000 |
| Bar Harrow (Bullock Driven) | 800 |
| Inter-Row Cultivator<br>(With Ridger and Fertilizer attachment) | 15,000-17,000 |
| Rabi Seed Drill 9-Rows | 7,500-10,000 |
| Rabi Seed Drill 11-Rows | 9,000-11,500 |

| | |
|---|---|
| Rabi Seed Drill 13-Rows | 10,500-12,500 |
| Rabi Seed Drill (9-Rows + Fertilizer attachment) | 9,000-11,500 |
| Rabi Seed Drill (11-Rows + Fertilizer attachment) | 12,00-15,600 |
| Rabi Seed Drill (13-Rows + Fertilizer attachment) | 14,000-17,000 |
| Kharif Drill (4-Rows) | 7,000-11,000 |
| Kharif Drill (5-Rows) | 8,000-12,000 |
| Kharif Drill (4-Row + fertilizer attachment) | 10,000-14,500 |
| Manual Knapsack Sprayer. | 1,000-1,600 |
| Motorized Knapsack Sprayer. | 6,000-10,000 |
| Tractor Operated Boom Sprayer | 25,000-40,000 |
| Tractor Operated Blower Sprayer | 40,000 |
| Self Propelled Combine Harvester | 1.9-2.5 million |
| Potato Digger | 9,000-10,000 |
| Potato Digger Double Row, (Conveyer Type) | 25,000 |
| Wheat Thresher | 45,000-50,000 |
| Rice Thresher with P. T. O. | 35,000 |
| Rice Thresher Motor Driven | 50,000 |
| Maize Sheller | 11,000-15,000 |
| Farm Trolley, 2 wheels | 19,000-31,500 |
| Farm Trolley 4 wheels | 43,000 |
| Cane Crusher Bullock Driven | 6,500-7,500 |
| Cane Crusher Power Driven (with electric motor) | 12,000-18,000 |
| Fodder Cutter Manual | 1,500-1,750 |
| Fodder Cutter Bullock Driven | 4,000-7,000 |
| Fodder Cutter Power Driven (with electric motor) | 3,000-5,000 |
| Pudding Wheel for 50 HP Tractor | 1,800-2,200 |
| Pudding Wheel for 60 HP and above tractors | 2,400-2,600 |

Source: Agricultural Development Bank of Pakistan Office, Islamabad.

## Cost Per Hour of Operation - Tractor/Cultivator (Rs)

| Cost Items | Fiat 480 | Cultivator |
|---|---|---|
| Market price 01.03.1993[a] | 2,75,900.00 | 8,500.00 |
| Depreciation cost/hour[b] | 24.84 | 3.06 |
| Interest cost/hour[c] | 18.96 | 1.17 |
| Fuel cost/hour[d] | 26.01 | - |
| Lubrication cost/hour[e] | 2.60 | - |
| Repair/spare cost/hour[f] | 27.59 | 1.34 |
| Shed cost/hour[g] | 1.19 | - |
| Labor cost/hour[h] | 4.50 | - |
| Total cost | 105.69 | 5.57 |
| Total: | 111.26 | |

a) Agricultural Development Bank of Pakistan Office, Islamabad.

b) Annual depreciation cost per hour was calculated by applying the following formula:

$$D = \frac{C - S}{L}$$

Where,
D = depreciation cost per hour,
C = new market price of the tractor/cultivator,
S = Salvage value. It was assumed to be 10% of the market price.
L = Serviceable life in hours. Life of tractor is taken to be 10 years or 10,000 hours. Life of cultivator is taken to be 5 years or 2500 hours. See Chaudhry and Ahmad 1982(b).

c) Annual interest cost was estimated by using the following formula:

$$I = \frac{(C + S)}{2} \times i$$

where,
I = Annual interest charge
C and S = as already defined,
i = rate of interest (12.5%). Annual interest cost was divided by annual operating hours (i.e. 1000 hours for tractor and 500 hours for cultivator) to determine the interest cost per hour.

d) Diesel consumption per hour = 5.15 litres (see Chaudhry and Ahmad 1982(b) and price per litre = Rs. 5.05.

e) Lubrication cost was assumed to be 10% of the fuel cost.

f) Repair/spare cost is assumed to be equal to 100 percent and 40 percent of the purchase price of the tractor and cultivator respectively (see Chaudhry and Ahmad 1982(b)

g) Shed cost was updated by applying the wholesale building material index to the cost estimated by Chaudhry and Ahmad 1982(b).

h) The Tractors are generally operated by the family labor. Therefore, the cost of the family labor as estimated by Chaudhry et al 1992 was used.

## Cost per Hour of Operation - Tractor (Raja Hall (Rs)

| Cost Items | Fiat 480 | Cultivator |
|---|---|---|
| Market price 01.03.1993[a] | 2,75,900.00 | 7,750.00 |
| Depreciation cost/hour[b] | 24.84 | 2.79 |
| Interest cost/hour[c] | 18.96 | 1.07 |
| Fuel cost/hour[d] | 31.21 | - |
| Lubrication cost/hour[e] | 3.12 | - |
| Repair/spare cost/hour[f] | 27.59 | 1.24 |
| Shed cost/hour[g] | 1.19 | - |
| Labor cost/hour[h] | 4.50 | - |
| Total cost | 111.41 | 5.10 |
| | Total: 116.51 | |

a) Agricultural Development Bank of Pakistan Office, Islamabad

Note: Procedure for the estimation of cost of various components (a - h) of tractor is the same as discussed under tractor cultivation. However, fuel consumption per hour is assumed to be 20 percent higher for "Raja Hall" than cultivator.

Procedure for the estimation of depreciation and interest cost of "Raja Hall" is similar to that of tractor. Life of the "Raja Hall" is taken to be five years or 2500 hours. Salvage value is assumed to be 10 percent of the market price. Repair and spare cost is assumed to be 40 percent of the market price over the life period.

## Cost per Hour of Operation - Tractor Drill (Rs)

| Cost Items | Fiat 480 | Cultivator |
|---|---|---|
| Market price 01.03.1993[a] | 2,75,900.00 | 10,250.00 |
| Depreciation cost/hour[b] | 24.84 | 3.69 |
| Interest cost/hour[c] | 18.96 | 1.41 |
| Fuel cost/hour[d] | 20.81 | - |
| Lubrication cost/hour[e] | 2.08 | - |
| Repair/spare cost/hour[f] | 27.59 | 1.64 |
| Shed cost/hour[g] | 1.19 | - |
| Labor cost/hour[h] | 4.50 | - |
| Total cost | 99.97 | 6.74 |
| Total: | 106.71 | |

a) Agricultural Development Bank of Pakistan Office, Islamabad.

Note: Procedure for the estimation of cost of various components (a - h) of tractor is the same as discussed under tractor cultivation. However, fuel consumption is taken to be 80 percent of the fuel used with cultivator.

Procedure for the estimation of depreciation and interest cost of "drill" is similar to that of tractor. Life of the "drill" is taken to be five years or 2500 hours. Salvage value is assumed to be 10 percent of the market price. Repair and spare cost is assumed to be 40 percent of the market price over the life period.

## Cost per Hour of Operation - Tractor Threshing (Rs)

| Cost Items | Fiat 480 | Drill |
|---|---|---|
| Market price 01.03.1993[a] | 2,75,900.00 | 47,500.00 |
| Depreciation cost/hour[b] | 24.84 | 17.10 |
| Interest cost/hour[c] | 18.96 | 6.53 |
| Fuel cost/hour[d] | 31.21 | - |
| Lubrication cost/hour[e] | 3.12 | - |
| Repair/spare cost/hour[f] | 27.59 | 4.75 |
| Shed cost/hour[g] | 1.19 | - |
| Labor cost/hour[h] | 4.50 | - |
| Total cost | 111.41 | 28.38 |
| | Total: 139.76 | |

a) Agricultural Development Bank of Pakistan Office, Islamabad.

Note: Procedure for the estimation of cost of various components (a - h) of tractor is the same as discussed under tractor. However, fuel consumption per hour is assumed to be 20 percent higher for threshing operation than cultivation.

Procedure for the estimation of depreciation and interest cost of thresher is similar to that of tractor. Life of the thresher is taken to be five years or 2500 hours [see Chaudhry and Ahmad 1982(b)]. Salvage value is assumed to be 10 percent of the market price. Repair and spare cost is assumed to be 25 percent of the market price. Repair/spare cost is assumed to be 25 percent of the market price over the life period.

## Operational Cost per Hour of One Cusec Capacity Diesel Tubewell (Rs)

| Cost Items | Rs. |
|---|---|
| Installation Cost[a] | 72,500.00 |
| Depreciation cost/hour[b] | 3.84 |
| Interest cost/hour[c] | 2.63 |
| Diesel cost/hour[d] | 13.23 |
| Lubrication cost/hour[e] | 0.13 |
| Replacement/repair cost/hour[f] | 1.90 |
| Building cost/hour[g] | 1.44 |
| Labor cost/hour[h] | 4.50 |
| Total cost | 27.67 |

a) Seckler et al. (1987) estimated the installation cost of the diesel tubewell to be Rs. 54,500 for the year 1985-86. It is assumed that the installation cost increased by Rs. 3000.00 annually.

b) Annual depreciation cost per hour was calculated by applying the following formula:

$$D = \frac{C - S}{L}$$

Where,
D = depreciation cost per hour,
C = new market price of the tractor/cultivator,
S = Salvage value. It was assumed to be 10% of the market price.
L = Serviceable life in hours. Life of tractor is taken to be 10 years or 10,000 hours. Life of cultivator is taken to be 5 years or 2500 hours. See Chaudhry and Ahmad 1982(b).

c) Annual interest cost was estimated by using the following formula:

$$I = \frac{(C + S)}{2} \times i$$

where,
I = Annual interest charge
C and S = as already defined,
i = rate of interest (12.5%). Annual interest cost was divided by annual operating hours (i.e. 1000 hours for tractor and 500 hours for cultivator) to determine the interest cost per hour.

d) Diesel consumption per hour = 2.62 litres (see Chaudhry and Ahmad 1982 (c) and price per litre = Rs. 5.05.

e) Lubrication cost was assumed to be 1% of the fuel cost.

f) Replacement/repair cost was estimated at the rate of 4.95 percent of the installation cost (Afzal et al 1980). The annual cost was divided by the annual working hours i.e. 1893, to estimate the replacement/ repair cost per hour.

g) Building cost per hour of diesel tubewell calculated by Chaudhry and Ahmad 1982 (c) for the year 1979-80, was used to calculate the cost by applying the wholesale building material index.

h) In most of the cases, the tubewell was operated by the family labor. Therefore, the cost per hour of the family labor as estimated by Chaudhry et al 1992 (c) for the year 1991-92 was used.

## Operational Cost per Hour of One Cusec Capacity Electric Tubewell (Rs)

| Cost Items | Rs. |
|---|---|
| Installation Cost[a] | 54,220.00 |
| Depreciation cost/hour[b] | 2.15 |
| Interest cost/hour[c] | 1.46 |
| Electricity cost/hour[d] | 4.39 |
| Replacement/repair cost/hour[e] | 0.84 |
| Building cost/hour[f] | 1.44 |
| Labor cost/hour[g] | 4.50 |
| Total cost | 14.78 |

a) Seckler et al. (1987) estimated the installation cost of the electric tubewell to be Rs. 41,000 for the year 1985-86. It is assumed that the installation cost increased at the same rate as in case of diesel tubewell.

b) Annual depreciation cost per hour was calculated by applying the following formula:

$$D = \frac{C - S}{L}$$

Where,

D = depreciation cost per hour,
C = new market price of the tractor/cultivator,
S = Salvage value. It was assumed to be 10% of the market price.
L = Serviceable life in hours. Life of tractor is taken to be 10 years or 10,000 hours. Life of cultivator is taken to be 5 years or 2500 hours. See Chaudhry and Ahmad 1982(b).

c) Annual interest cost was estimated by using the following formula:

$$I = \frac{(C + S)}{2} \times i$$

where,

I = Annual interest charge
C and S = as already defined,
i = rate of interest (12.5%). Annual interest cost was divided by annual operating hours (i.e. 1000 hours for tractor and 500 hours for cultivator) to determine the interest cost per hour.

d) Electricity consumption per hour = 8.95 unit [see Chaudhry and Ahmad 1982(c)]. Price/unit = Rs. 0.49

e) Replacement/repair cost was estimated at the rate of 3.95 percent of the installation cost. The annual cost was divided by the annual working hours i.e. 2540, to estimate the replacement/repair cost per hour.

g) Building cost per hour of diesel tubewlell calculated by Chaudhry and Ahmad 1982 (c) for the year 1979-80, was used to calculate the cost by applying the wholesale building material index.

h) In most of the cases, the tubewell was operated by the family labor. Therefore, the cost per hour of the family labor as estimated by Chaudhry et al(1992) for the year 1991-92 was used.

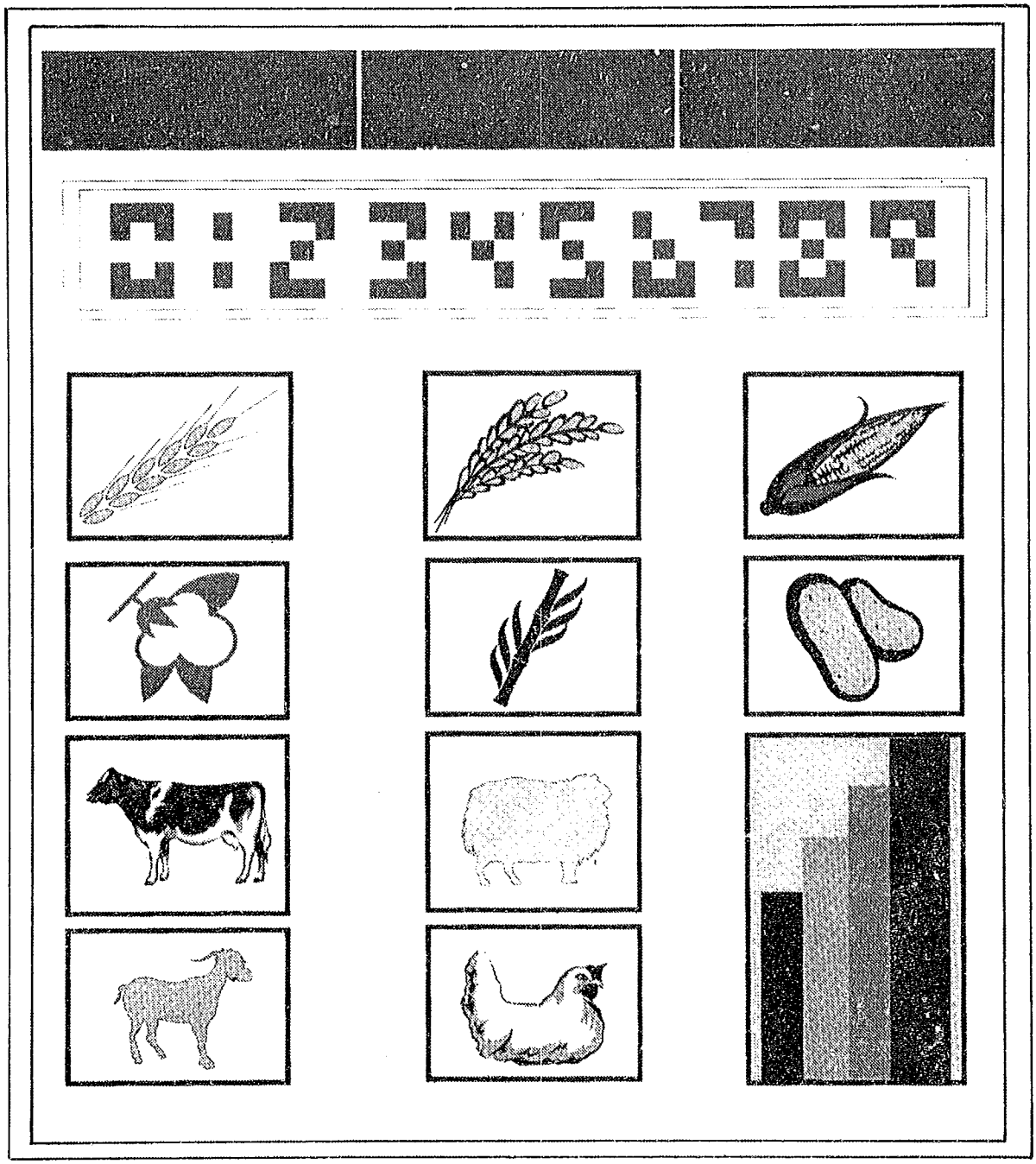
## Operational Cost per Hour of Tubewell Driven by Tractor

| Cost Items | Price of Tractor Fiat 480 | Installation cost of tubewell excluding the cost of diesel engine and engine accessories |
|---|---|---|
| Installation cost/price of tractor/tubewell[a] | 2,75,900.00 | 43,500.00 |
| Depreciation cost/hour[b] | 24.84 | 2.31 |
| Interest cost/hour[c] | 18.96 | 1.58 |
| Fuel cost/hour[d] | 26.01 | - |
| Lubrication cost/hour[e] | 2.60 | - |
| Repair/spare cost/hour[f] | 27.59 | 1.14 |
| Shed cost/hour[g] | 1.19 | - |
| Labor cost/hour[h] | 4.50 | - |
| Total cost | 105.69 | 5.03 |
| Total: | 110.72 | |

a) Installation cost of tubewell excluding the cost of diesel engine and engine accessories is taken to be 60 percent of the total cost including engine (Seckler et al. 1987).

Procedure for the estimation of cost of various components (a - h) is similar as discussed under the operation cost of diesel tubewell and the operation cost of tractor cultivator.

# Recommended Practices



## RECOMMENDED PRACTICES FOR WHEAT*

**Before Sowing**: The land is ploughed up with a furrow turning plough once especially in barani areas and normally in irrigated areas. This enhances the moisture holding capacity of the soil. The weed seeds are also buried deep in the soil. The land should be levelled properly in order to attain: (a) optimum moisture condition at one time, (b) better and uniform effect of fertilizer (c) better and uniform germination. Each acre should be divided into four equal parts in order to save 15-20 percent water.

**After "Rauni"**

i) **Ranbar**: The land is planked twice and left for 3-4 days
ii) **Dabb**: One to two ploughings followed by sohaga/planking are given to the seedbed for sowing of wheat, after 'ranbar'. The field is left for 5-7 days so that the seeds of weeds can germinate. The field is again ploughed once or twice which is followed by planking so that weeds get uprooted and decay in the soil. The 'dabb' method should be normally adopted for early and mid sowing but is not useful for the late sowing.

**Varieties of Wheat**: Recommended varieties along with the seed rate for various areas are given in Table 1.

**Method of Sowing**: The "Pora" method is used in barani areas to drop the seed at a proper depth. Two precautions need to be taken i.e. furrows should be broad and shallow. Narrow and deep furrows bury the seeds with soil. Sohaga/planking should not be done after sowing the seed with the pora. Seeds should be sown at a depth of 4-5 cm in order to get the best germination. The seeds should be soaked in water at least 3-4 hours before sowing in order to get good germination, especially when the soil has low moisture.

In irrigated areas, wheat is sown by the following four methods:
1) Automatic Rabi drill (bullock or tractor driven)
2) "Pora"
3) "Kera"
4) Broadcasting

Out of these four methods, the drill is to be preferred. Planking (sohaga) should not be used when the drill method is used and the land has been prepared thoroughly and optimum moisture conditions also prevail. However, planking should be done after drill when the soil is somewhat light (i.e. sandy) and water is also not sufficient.

**Based on recommendations made by the Government of the Punjab, 1987 (i,k), 1993 (k1), Hanif, 1993 and Pakistan Agricultural Research Council.*

**Use of Fertilizer**: Following points may be observed for the use of fertilizers:

- Soil analysis should be done for the proper application of fertilizers.
- Phosphatic fertilizers should be used alongwith nitrogenous fertilizers both in the irrigated and barani areas.
- All P and one half of N should be applied at the time of sowing, while the rest of N should be applied with first irrigation. In sandy soils, fertilizers may be applied in three installments in order to avoid leaching.
- If P fertilizer is not applied at the time of sowing due to some reasons in irrigated areas, then it should be applied with first irrigation. However, bar harrow should be used either before irrigation or on attaining "wattar" condition after first irrigation.
- All fertilizer should be applied at the time of sowing in case of late planting.
- For the effective use of chemical fertilizer, farm yard manure/green manuring should also be practised.
- In the salt affected soils, single super phosphate and ammonium sulphate should be applied.

The quantities of N, P and K recommended for different areas and according to the fertility status are given in Table 2 and 3.

**Irrigation**: Excessive irrigations should not be applied to the wheat crop. Too many irrigations lead to leaching of fertilizer and lodging of the crop. Wheat fields must be irrigated at critical growth periods.

- First irrigation should be applied 12-18 days after germination (i.e. on tillering and crown root formation)
- Second irrigation on booting (i.e. 30-40 days after first irrigation)
- Third irrigation on grain formation
- Fourth irrigation at grain formation or at the end of March or beginning of April when temperature rises.

Normally 4-5 irrigations are sufficient to get a successful crop. However, 1 to 2 additional irrigations are needed in sandy soil.

It may also be noted that if wheat is sown after rice then first irrigation should be applied to wheat after 30-40 days. If there is shortage of water, then the irrigation schedule as shown in Table 4 may be observed.

**Weeding:** According to a rough estimates about 1/3 yield is reduced due to weeds. Dabb is done before sowing of wheat for the eradication of weeds. Bar harrow and hoeing is also recommended. Use of weedicides is getting popular among the farmers. Recommended weedicides for the control of weeds of wheat crop are shown in Table 5. Instructions on the container of the weedicides should be carefully read and followed.

**Diseases**

Loose Smut
Flag Smut
Old Bunt
Karval Bunt
Stripe Rust
Leaf Rust
Stem Rust
Ear Cockle
Powdery Mildew
Downey Mildew
Foot Rot
Black Point

Following measures may be taken for the control of these diseases.

- Only disease resistant varieties should be grown

- Only healthy seed should be used. Seed should be treated with two kg. of any of the following fungicides.

    - Vitavax
    - Topsin M
    - Bayton
    - Panoram
    - Derosal
    - Benlate

  Seed treatment should be done at least 24 hours before sowing.

- Affected disease parts should be either burnt or buried in the soil.
- Interval between irrigations should be increased if there is rust attack.

**Insect-Pests:** The wheat crop is attacked by a number of insect-pests. The list of insects along with their control is given in Table 6.

**Precautions at the time of harvesting and threshing**

The following precautions should be observed during unfavorable weather:

- Arrangements about laborers, thresher, combine harvester etc. should be made before harvesting.
- In case of heavy rains, the crop must be kept standing instead of harvesting in order to avoid losses resulting from bundles.
- Small bundles should be made with ears on one side. The ears of the bundles may be kept upward during severe and bad weather.
- Threshing floor should only be on higher plain fields.
- The operation of harvesting and threshing should be carried out simultaneously.
- During rains, grain losses may be avoided by using plastic sheets, tarpaulins etc.

## Table 1: Date of Sowing and Seed Rate of Recommended Varieties of Wheat

| Name of Variety | Time of Sowing | Seed Rate per acre (kg) | Suitable District |
|---|---|---|---|
| **Barani Areas** | | | |
| Pak 81 | 25th Oct to 30th Nov. | 40 | Barani area of all Districts |
| Lyallpur 73 | 20th Oct to 15th Nov. | 40 | -do- |
| Barani 83 | 30th Oct to 30th Nov. | 40 | -do- |
| Faisalabad 83 | 20th Nov to 10th Dec. | 45 | -do- |
| Blue silver | 20th Nov to 10th Dec. | 45 | -do- |
| Chakwal 86 | 20th Oct to 15th Nov. | 40 | -do- |
| Rawal 87 | 20th Oct to 15th Nov. | 40 | -do- |
| **Irrigated Areas** | | | |
| Pak 81 | 25th Oct to 15th Dec. | 40 | All Districts |
| Inqulab 91 | 10th Nov-End of Dec | 45 | -do- |
| Passban 90 | 1st Nov to 10th Dec | 40 | -do- |
| Lyallpur 73 | 1st Nov to 15th Nov. | 40 | -do- |
| Punjab 81 | 1st Nov to 15th Nov. | 40 | Southern Districts of Punjab (Multan & Bahawalpur Div.) |
| Kohinoor 83 | 1st Nov to 15th Dec. | 40 | Central & Southern Districts of Punjab |
| Punjab 85 | 1st Nov to 30th Nov. | 40 | -do- |
| Sutluj 86 | 1st Nov to 30th Nov. | 40 | -do- |
| Blue Silver | 20th Nov to 15th Dec. | 45 | All Districts of Punjab |
| Faisalabad 83 | 15th Nov to 15th Dec. | 45 | -do- |
| Faisalabad 85 | 15th Nov to 20th Dec. | 45 | -do- |
| Bahawalpur 79 | 20th Nov to 31st Dec. | 45 | Only Multan & Bahawalpur Div. |

*Note: Among the above varieties, Inqulab 91, Paasban 90, Pak 81, Faisalabad 83, Punjab 85, Faisalabad 85, Barani 83, Chakwal 86, Rawal 87 and Sutluj 86 have the highest potential.*

## Table 2: Fertilizer Doses Required in Barani Areas

| S.No. | Rainfall | Nutrients (Kg/Acre) | | | Quantities of fertilizers in bags (Before sowing) |
|---|---|---|---|---|---|
| | | N | P | K | |
| 1. | Low rainfall areas Annual rainfall 350 mm: Barani areas of Rajanpur, Liah, D.G.Khan, Muzzafar-gargh, Bhakkar, Mianwali, Khushab districts. | 23 | 23 | 25 | One bag of DAP + $_{3/4}$ Urea + 1 SOP<br>OR<br>2 NP + 1 SOP<br>OR<br>$2_{1/2}$ SSP + $_{3/4}$ AN + 1 SOP<br>OR<br>$2_{1/2}$ SSP + 1 AS + 1 SOP |
| 2. | Average Rainfall: Annual rainfall 350 to 500 mm. Barani Areas of Pindi Ghaib, Talagang, Chakwal and Pind Dadan Khan tehsils. | 34 | 23 | 25 | 1 DAP + $_{1/2}$ Urea + 1 SOP<br>OR<br>2 NP + $_{1/2}$ Urea + 1 SOP<br>OR<br>$2_{1/2}$ SSP + $2_{1/2}$ AN + 1 SOP<br>OR<br>$2_{1/2}$ SSP + $2_{1/2}$ AS + 1 SOP |
| 3. | High Rainfall: Annual rainfall more than 500 mm. Barani areas of Rawalpindi, Campbellpur, Jehlum, Gujrat, Kharian and Shakargarh tehsils. | 46 | 34 | 25 | $1_{1/2}$ DAP + $1_{1/2}$ Urea + 1 SOP<br>OR<br>3 NP + $_{1/2}$ Urea + 1 SOP<br>OR<br>$3_{3/4}$ SSP + $3_{1/2}$ AN + 1 SOP<br>OR<br>$3_{3/4}$ SSP + $2_{1/2}$ AS + 1 SOP |

AN : Ammonium nitrate
AS : Ammonium sulphate
NP : Nitrophos
N : Nitrogen
K : Potassium
SSP : Single superphosphate
DAP : Diammonium phosphate
SOP : Sulphate of potash
P : Phosphorus

## Table - 3: Fertilizer Doses Required According to Fertility Status in Irrigated Areas

| S.No. | Fertility Status | Nutrients (Kg/acre) | | | Quantities of fertilizers needed in bags at the time of sowing | Bags with 1st or 2nd irrigation |
|---|---|---|---|---|---|---|
| | | N | P | K | | |
| 1. | Poor fertile Soils (8 to 10 mds. yield without fertilizer) i.e. after cotton and rice. | 55 | 46 | 25 | 2 DAP + $_{3/4}$ Urea + 1 SOP<br>OR<br>5 SSP + $1_{1/2}$ Urea + 1 SOP or $1_{1/2}$AN.<br>OR<br>5 SSP + $2_{1/2}$ AS + 1 SOP or $2_{1/2}$AN<br>OR<br>5 SSP + $2_{1/4}$ AN + 1 SOP or $2_{1/4}$AN<br>OR<br>4 NP + 1 SOP | 1 Urea<br><br>1 Urea or $2_{1/2}$ AS<br><br>$1_{1/4}$ Urea or 3 AS<br><br>$1_{1/4}$ Urea or 3 AS<br><br>$_{1/2}$ Urea or 1 AS |
| 2. | Average fertile soils (15-20 mds. yield without fertilizer). | 46 | 34 | 25 | 1 DAP + 1 Urea + 1 SOP<br>OR<br>3 SSP + 1 Urea + 1 SOP<br>OR<br>$2_{1/2}$ NP + 1 SOP | 1 Urea<br><br>1 Urea<br><br>$_{3/4}$ Urea or $1_{1/2}$ AS. |
| 3. | Fertile Soils (20-25 mds without fertilizers). | 34 | 23 | 25 | 1 DAP + $_{1/2}$ Urea + 1 SOP<br>OR<br>$2_{1/2}$ SSp + $_{3/4}$ Urea + 1 SOP<br>OR<br>$2_{1/2}$ SSP + 1 SOP + $1_{1/4}$ AN<br>OR<br>$2_{1/2}$ SSP + $1_{3/4}$ AS + 1 SOP or $1_{1/4}$ AN<br>OR<br>2 NP + 1 SOP | $_{3/4}$ Urea<br>$1_{1/4}$ AS<br>$_{3/4}$ urea<br>$1_{1/4}$ AN or $1_{3/4}$ AS.<br>$_{3/4}$ Urea or $1_{1/4}$ AN or $1_{3/4}$ AS.<br>$_{3/4}$ Urea or $1_{1/2}$ AN<br><br>$_{1/4}$ Urea or 1 AN |

AN : Ammonium nitrate SSP : Single superphosphate
AS : Ammonium sulphate DAP : Diammonium phosphate
NP : Nitrophas SOP : Sulphate of potash

**Table - 4: Schedule of Irrigation**

| Availability of Irrigation Water | Critical State of Growth when Water is needed |
|---|---|
| For one irrigation | Crown root formation stage |
| For two irrigations | First at crown root formation, and second at booting |
| For three irrigations | First at crown root formation, second at booting and third at grain formation |
| For four irrigations | First at crown root formation, second at tillering, third at booting and fourth at grain formation |
| For five irrigations | First at crown root formation, second at tillering, third at booting, fourth at heading and fifth at grain formation. |
| For six irrigations | First five irrigations should be given as in (5). Sixth should be given when the grains are yellowish. |

**Table - 5: Recommended Weedicides for the Eradication of Weeds**

| Name of Weedicide | Quantity/acre |
|---|---|
| **Immediately After Sowing of Wheat** | |
| Stomp 330 E | 1.5 - 2.0 litres |
| Tolkan 50 WP | 800 Grams |
| **At First Irrigation in Tar Wattar for All Types of Weeds** | |
| Dicuran M.A. 60 W | 0.90 - 1.20 kg |
| Arelon 75 W P | 0.50 - 0.75 litres |
| Arelon F W | 1 litre |
| Tolkan 50 WP | 0.50 Kilogram |
| Tribunil, 70 WP | 0.70 Kilogram |
| Graminon 500 FW | 0.90 litre |
| Dosanex 80 WP | 0.65 Kilograms |
| **At First Irrigation in Tar Wattar for Broadleaf Weeds** | |
| Brominol 40 E | 0.50 litre |
| Bactril M 40 EC | 0.50 litre |

**Table - 6: Insect Pests of Wheat and their Control**

| Name of Insect | Name of Pesticide | Dose/acre |
|---|---|---|
| White ants | Dieldrin 20% | 2.50 - 3.00 liter |
| Wheat weevil | B.H.C. 12% | 2.5 kg |
| Aphid | Nogas | 250 ml. |
| Jassid | Nogas 100% | 250 ml. |
| Army Worm | B.H.C. Nogas 100% | 250 ml. |
| Pink Gramints | Destory Stubbles of rice crop. | |

## RECOMMENDED PRACTICES OF RICE*

**Seed Rate and Time of Raising Nursery:** Only recommended varieties of rice as shown in Table 7 should be grown. The farmers can obtain seed from Punjab Seed Corporation or Rice Research Institute, Kala Shah Kaku. The recommended seed rate of various varieties is also indicated in Table 7.

To obtain maximum yield, nursery should be raised and transplanting should be done at the proper time. Early sowing of nursery should not be done because of heavy attack of rice borer. The recommended time of raising nursery and transplanting of various varieties is also given in Table 7.

**Table - 7: Seed Rate, Time of Raising Nursery and Transplanting of Recommended Varieties of Rice**

| Name of Variety | Seed Rate per acre (kg) puddling method | Time of Raising Nursery | Time of Transplanting |
|---|---|---|---|
| IRRI 6 | 6-7 | 20th May to 7th June | 20th June to 7th July |
| K.S. 282 | 6-7 | 20th May to 7th June | 20th June to 7th July |
| Basmati 370 | 4-5 | 1st June to 20th June | 1st July to 20th July |
| Basmati 385 | 4-5 | 1st June to 20th June | 1st July to 20th July |
| Basmati Pak | 4-5 | 1st June to 20th June | 1st July to 20th July |
| Basmati 198 | 4-5 | 1st June to 15th June | 1st July to 15th July |

Note: K.S. 282 nursery should not be raised before June 1st in Sahiwal and Southern Districts of Punjab.

**Methods of Raising Nursery:** The nursery is raised by following three methods in the Punjab:

**Puddling method:** This method is commonly used in the rice growing area i.e. Sheikhupura, Gujranwala and Sialkot. The field selected for raising nursery is ploughed in dry or wattar condition twice. Then the field is flooded with water. Then double ploughing with planking on standing water is carried out weekly

**Based on recommendations made by the Government of the Punjab 1987(j), 1993 (j1), Majid and Iqbal, 1987; Pakistan Agricultural Research Council 1984-86, Rasul and Saeed, Department of Agriculture, Government of the Punjab, 1988.*

in a period of 25-30 days. Finally land is levelled with sohaga. Then the field is divided into four parts of 2 kanals each. This method of raising nursery lessens the growth of weeds and gives healthy seedlings. Seedlings are ready for transplanting in 25-30 days.

**Dry method:** This method is practised where there is a shortage of water and water cannot stand in the field. The land is prepared by dry method. The field is ploughed in wattar after irrigation and then planked. This is done two times at an interval of 7-10 days. This helps in the eradication of weeds. Then the field is divided into small parts. The dry seed is broadcasted and a thin layer of farm yard manure or wheat bhoosa is spread over the field. The plots are irrigated at proper intervals according to water requirements. There is more growth of weeds which can be picked easily. Seedlings are ready in 35-40 days.

**Raab method:** This method is practised in Muzaffargarh and Dera Ghazi Khan. The land is repeatedly ploughed and planked in order to break the clods. The land is levelled and a two inches thick layer of farm yard manure is spread and then fired. The ash is pressed with a spade. The dry seed is spread and then irrigated at proper intervals according to the water requirements. The seedlings are ready for transplanting in 35-40 days. Seed rate for the dry method and the "Raab" method is reported in Table 8.

**Table - 8: Seed Rate Per Acre for the Dry and "Raab" Methods of Raising Nursery (Kg/Acre)**

| Variety | Dry Method | Raab Method |
|---|---|---|
| K.S. 282 and IRRI | 68-10 | 12-15 |
| Basmati 370, Basmati 385 Basmati Pak and Basmati 198 | 6-7 | 10-12 |

**Preparation of Seed:**

* Soak the seed in saltish water (i.e. 450 grams of salt in 18 litres of water).

* Light and impure seed should be removed from the top.

* Wash the seed two times in the clean water so that there is no sign of salt. Then the seed should be soaked in water for 24 hours. 15-20 kg. seed may be placed under shade and be covered with wet bags.

* The seed may be stirred 2-3 times in a day. If the seed is dry then water must be sprinkled. In this way seed will germinate in 36-48 hours.

* Broadcast the germinated seed in the puddled field. While broadcasting the seed, the depth of water may be kept 2.5 - 3.0 cm. Broadcasting of seed should be done preferably in the evening. For a week, the field should be irrigated in the morning and water should be drained out in the evening. After one week, water should not be drained out. Depth of water may be increased with the growth of seedlings. However, the depth of water should not increase beyond 5-7 cm. If the seedlings are poor, then fertilizer at the rate of 1/2 kg. of Ammonium Sulphate or 1/4 kg. of Urea may be applied. The fertilizer should be applied about 10 days before transplanting the seedlings. The seedlings get ready for transplanting after 25-30 days.

**Control of Insect Pests of Rice Nursery:** To protect the nursery from insect pests the following measures should be taken.

* Sowing of nursery should not be done before 20th May.

* Pesticides should be applied in two doses as indicated in Table 9.

**Table - 9: Pests Control of Rice Nursery**

| Name of Pest | Treatment Name of Pesticide | Dose/acre | |
|---|---|---|---|
| | | First Treatment for 8-10 days Nursery | Second Treatment for 15 days Nursery |
| Surface grass hoppers | BHC 10% + DDT | 1.5 kg 3.5 kg | |
| Borers | Basudin 10 G | - | 9 kg |
| | Diazinon 10 G | - | 9 kg |
| White Borer Yellow Borer | Padan 4 G | - | 10 kg |
| | Furadan 3 G | - | 10 kg |
| | Curaterr 3 G | - | 10 kg |
| | Advantage 5 G | - | 12 kg |
| | Sevidol 8 G | - | 9 kg |
| | Carbril 10 G | - | 10 kg |
| | Ekalux 5 G | - | 9 kg |
| | Birlane 10 G | - | 9 kg |
| | Sumithion 50 EC | - | 500 ml |
| | Malathion 57 EC | - | 1000 ml |
| | Sunfuran 3 G | - | 10 kg |
| | Diafuran 3 G | - | 10 kg |
| Rice Hispa | Seven 10% | - | 10 kg |
| Leaf Roller | Mipcin-50-WP | | 900 gm |
| Army worm | Orthene-75-SP | | 500-750 gm |
| | Lannate-90-WSP | | 250-300 gm |

**Preparation of Field for Transplanting**: Various methods are used for the preparation of land depending upon water availability, type of soil, etc. Normally land is prepared by three methods; 1) Puddling method, 2) Partially puddled method and 3) Dry method.

In the puddling method, the field is irrigated 25-30 days before transplanting and ploughing is carried out after 7-10 days. In the partially puddled method where water does not stand readily in the field, the land is prepared dry. The field is irrigated 7-10 days before transplanting. Two to three days after the application of water the land is ploughed twice and then levelled with sohaga. In the dry method, the land is prepared dry four times by ploughing the field twice and then planking. The field is watered one to two days before transplanting of seedling.

**Transplanting of Nursery**: Watering should be done one day before uprooting the nursery. At the time of transplanting, the field should be levelled properly

and water depth should not be more than 3.75 - 5.00 cm. Transplant two seedlings in one hole in case of 25-40 days old seedling. However, 3-4 seedlings should be planted in one hole in case of more than 40 days old seedling which tiller less. Transplanting of 50 days old seedling may be avoided, as this will reduce the yield by 30-40%. The plant to plant distance should be kept 23x23 cm - this will result in 80,000 holes per acre.

**Fertilizer Application**

Recommended doses of fertilizers at various stages of growth of different rice varieties are given in Table 10.

Zinc deficiency has been noticed in rice growing areas. Zinc deficiency can be overcome by taking the following measures:

* The roots of seedling should be soaked in zinc oxide 2 percent solution before transplanting. Solution of one kg of zinc oxide in 50 litres of water is sufficient for nursery to be transplanted in one acre.

* If there is severe deficiency of zinc then zinc sulphate 35% at the rate of 5 kg or zinc sulphate 20% at the rate of 10 kg should be broadcast 10 minutes after transplanting.

**Irrigation**: The water application should be stopped 25-30 days after transplanting. If there is any water, it should be drained. Allow the field to dry for 5-6 days and then irrigate. Irrigate the field after the absorption of water of first irrigation. Water applications should be stopped about 15 days prior to the ripening of the crop.

**Eradication of Weeds**: Weedicides recommended for the control of weeds are given in Table 11.

**Diseases of Rice**: There are two major diseases of rice prevailing in Punjab i.e. Rice Blast and Stem Rot. For the control of blast, emphasis should be given on disease resistant varieties. Following fungicides can be applied for the control of rice blast.

- Rabcide @ 250 grams
- Daconil - 75 WP @ 500 grams
- Kasumin @ 500 grams
- Beam 75 @ 120 grams

For the control of stem rot, diseases resistant varieties may be grown and stubbles of the crop may be destroyed.

## Table - 10: Recommended doses of Chemical Fertilizers for Rice Crop.

| Variety | Fertility Status | Kgs. of Nutrients/Acre* | | | Quantity in Bags | | |
|---|---|---|---|---|---|---|---|
| | | N | P | K | At the time of Puddling with last Ploughing | 35 days after Trans-planting | 50 days after Trans-planting |
| IRRI 6<br>K.S 282 | a)After Wheat | 69 | 41 | 32 | 1 ½ Urea + 4 ½ SSP + 1 ¼ SOP<br>OR<br>1 ¾ DAP + ⅛ Urea + 1 ¼ SOP | 1 ½ Urea | -- |
| | b)After Berseem or Leguminous crops or fallow land. | 55 | 32 | 32 | 1 ½ Urea + 3 ½ SSP + 1 ¼ SOP<br>OR<br>1 ½ DAP + ½ Urea + 1 ¼ SOP | 1 Urea | -- |
| Basmati-385,<br>Basmati-198 | a)After Wheat | 55 | 32 | 32 | 1 Urea + 3 ½ SSP + 1 ¼ SOP<br>OR<br>1 ½ DAP + ½ Urea + 1 ¼ SOP | 1 Urea | -- |
| | b)After Berseem or Leguminous crops or fallow land | | | | ½ Urea + 3 ½ SSP + 1 ¼ SOP<br>OR<br>1 ¼ DAP + ¼ Urea + 1 ¼ SOP | 1 Urea | -- |
| Basmati-370,<br>Pak-Basmati | a)After Wheat | 34 | 27 | 27 | * ½ Urea + 3 SSP + 1 SOP<br>OR<br>1 DAP + ¼ Urea + 1 SOP | ½ Urea | ½ Urea |
| | b)After Berseem or Leguminous crops or fallow land | 27 | 27 | 27 | * ½ Urea + 3 SSP + 1 SOP<br>OR<br>1 ¼ DAP + ¼ Urea + 1 SOP | ¾ Urea | -- |

Note: SSP = Single Super Phosphate
SOP = Potassium Sulphate
DAP = Diammonium Phosphate

*Quantity recommended 25 days after transplanting.

**Table - 11: Control of Weeds of Rice Crop**

| Name of Weed | Name of Weedicide | Dose/acre |
|---|---|---|
| **Grass** | | |
| . Naru (Paspalum Distichum) | i) Saturn 10 G | 7 kg |
| . Dhodan (Echinochloa Sp) | ii) Machete 60 Ec | 800 ml |
| | iii) Rone Star 12 | 1.4 liters |
| | iv) Sundachlor 60 EC | 800 ml |
| **Sedges** | | |
| . Bari Choein (Cyperus Deformis) | --do-- | --do-- |
| . Shoti Ghoein (Cyperus Irria) | --do-- | --do-- |
| . Deela (Cyperus Rotunds) | --do-- | --do-- |
| **Broad Leaf Weeds** | | |
| . Jupati (Marsilla Minuta) | --do-- | --do-- |
| . Mirch Booti (Sphenoclea Zeyanaca) | --do-- | --do-- |
| . Kammi (Nymphaea Nauchella) | --do-- | --do-- |

**Control of Insect-pests:** The insecticides recommended for the control of various pests are given in Table 12.

**Harvesting:** The crop should be harvested when the lower parts of ears have been filled with grains but the ears are still green. Shattering of grains takes place if the crop is allowed to stand in the field for a longer period.

**Table - 12: Control of Pests of Rice Crop**

| Name of the Pest | Name of the Pesticide | Dose/acre | |
|---|---|---|---|
| | | First Treatment 25-30 days after Transplanting | Second Treatment 50 days after Transplanting |
| **Rice Borers** | | | |
| White Borer<br>Yellow Borer | Baseedin 10 G | 7 to 9 kg | |
| | Diazinon 10 G | 7 to 9 kg | |
| | Sevidol 8/8 | 9 kg | 10 kg |
| | Padan 3 G | 9 kg | 10 kg |
| | Furadan 3 G | 9 kg | 10 kg |
| | Advantage 5 G | 8 kg | 12 kg |
| | Lorsban | 9 kg | |
| | Birlane 10 G | 7 kg | 9 kg |
| | Alkalux 5 G | 7 kg | 9 kg |
| | Lorsban 5 G | - | 9 kg |
| | Sumithion 50 EC | 500 ml | 500 ml |
| | Malathion 57 EC | 1000 ml | 1000 ml |
| | Sumibas 75 EC | 400 ml | 400 ml |
| | Mipcin 50 WP | 900 ml | 900 ml |
| | Azodrin/Nuvacron | 250 ml | 250 ml |
| | Karate | 300 ml | 300 ml |
| | Rogor | 350 ml | 350 ml |
| **Rice Hispa** | Seven 10% | 10 kg | |
| **Leaf Roller** | Mipcin 50 W.P. | 900 gram | |
| **Army Worm** | - Orthene 75 SP | 500-700 grams | |
| | - Lannate 90 WSP | 250-300 grams | |
| | - Nogos | 500 ml | |
| **Spray:** | | | |
| Rice Borer<br>Yellow Borer | - Sumithion 50 EC | 500 ml. | |
| | - Sumibas 75 EC | 400 ml. | |
| | - Mipcin 50 W.P. | 900 ml. | |
| White Backed Plant Hopper | ----------do---------- | | |

## RECOMMENDED PRACTICES FOR MAIZE*

**Land Preparation:** If the maize is followed by another crop, then the soil inverting plough should be used. Normally 3-4 ploughings with planking are necessary to prepare the land for maize growing.

**Seed Rate:** The recommended seed rate is 12 kgs. for Kharif crop and 15 kgs. for Spring crop.

**Time and Method of Sowing:** The recommended time of sowing of improved varieties of maize in various areas is shown in Table 13.

Maize should be sown with the help of single row cotton drill or planter. The row to row distance may be kept 2.5 feet.

**Spacing:** The spacing of maize should be done before first irrigation or in "tar wattar". In other words spacing should be done when the plant has 4-6 leaves depending upon the variety. In case of Neelum, Akbar, Sultan and Sadak varieties, the plants are spaced at 23 cm apart, while in Agaiti distance from plant to plant should be 15 cm.

**Hoeing:** Two to three hoeings should be done to eradicate weeds. Weedicides for the control of weeds are given in Table 14.

**Fertilizer Application:** Recommendations about the use of fertilizers are given in Tables 15 and 16:

**Irrigation:** 6-8 irrigations are needed for the Kharif crop and 10-12 are required for the Spring crop. At the flowering stage the field should be irrigated otherwise there is danger of low yield. In the case of the Spring crop, light irrigations should be applied from the time at flowering to grain formation at short intervals.

**Control of Insect pests:** Kharif maize is heavily attacked by the maize borer and shoot fly. The attack of shoot fly on the Spring crop starts immediately after germination, while maize borers attack at the end of March. Insecticides recommended for the control of these insects are given in Table 17.

**Control of Diseases:** For the control of seed-borne maize diseases, seed should be treated with Vitavax @ 2 gms or Benlate @ 1.5 gms or Topsin-M @ 2 gms per kg of seed. Disease resistant varieties like Akbar, Sadaf, Agaiti etc. should be grown.

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**Based on recommendations made by the Government of the Punjab 1992 (z1) and Pakistan Agricultural Research Council, 1984 and Afzal, M: Maize Agriculture Research Institute, Yousafwala, Sahiwal.*

**Table - 13: Recommended Time of Sowing of Improved Varieties of Maize in Various areas.**

| Districts | Recommended Varieties | Time of Sowing | |
|---|---|---|---|
| | | Kharif | Spring |
| Rahim Yar Khan Bahawalnagar Bahawalpur Faisalabad, Jhang Toba Tek Singh | Neelum, Akbar, Sultan, Golden, Hybrid | Mid July to 10th August | Mid January to Mid Feb. |
| Sargodha, Mianwali | Agaiti-72 Sunehri | 10th to 20th August | 15th February to 7th March |
| Lahore, Sialkot, Gujranwala, Sheikhupura | Neelum, Sultan, Akbar, Golden, Hybrid | Mid July to 10th August | End of February to End of March |
| | Agaiti-72, Sunehri | 10th to 20th August | End of February to 15th March |
| Rawalpindi, Gujrat Jhelum, Attock except Mountain-eous areas | Sadaf, Akbar, Sultan, Golden Agaiti-72 Hybrid | According to "Monsoon" | End of February to 20th March |
| Mountaneous Areas of Rawalpindi | --do-- | ---do--- | 15th February to 20th March |

**Table - 14: Recommended Weedicides for the Control of Weeds of Maize Crop**

| Name of Weedicides | Quantity per acre |
|---|---|
| Bladex | $2_{1/2}$ litre |
| Primextra | $2_{1/2}$ litre |
| Banvel | 2 litre |

**Table - 15: Recommended Doses of Chemical Fertilizers for Maize Crop in Irrigated Areas**

| Fertility Status | Kgs. of Nutrients/Acre | | | Quantity in Bags | | |
|---|---|---|---|---|---|---|
| | N | P | K | Sowing Time | Plant Height 45 to 65 cm) | Pre-flowering stage |
| Poor soils | 68 | 54 | 37 | $2_{1/2}$ DAP + 1 $_{1/2}$ SOP | 1 Urea or 2 AS | 1 Urea or 2 AS |
| Average soils | 54 | 41 | 25 | $1_{3/4}$ DAP + 1 SOP | 3/4 Urea or $1_{1/2}$ AN | 3/4 Urea or $1_{1/2}$AS |

Note: DAP = Diammonium phosphate
SOP = Potassium sulphate
AS = Ammonium sulphate
AN = Ammonium nitrate

**Table - 16: Recommended Doses of Chemical Fertilizers for the Maize Crop in Rainfed Areas**

| Level of rainfall | Kgs. of Nutrient/acre | | | Quantity (bags) |
|---|---|---|---|---|
| | N | P | K | |
| Low rainfall areas | 23 | 23 | - | 1 DAP + 1 AN or 1 DAP + 3/4 Urea |
| High rainfall areas | 41 | 27 | - | 1 1/2 DAP + 1 1/2 Urea or 1 1/2 DAP + 2 1/2 AN |

Note: DAP = Diammonium phosphate
AN = Ammonium nitrate

**Table - 17: Control of Insect pests of Maize**

| Name of Insect | Name of Pesticide | Dose |
|---|---|---|
| Shoot Fly | Temarone | 400 ml |
| | Metasystox | 400 ml |
| | Azodrin | 400 ml |
| Shoot Fly & Stem Borer | <u>At the time of Thinning</u> | |
| | Baythrid TM | 400 ml |
| | Azophos | 400 ml |
| | Deltaphos | 400 ml |
| | <u>At First Irrigation</u> | |
| | Furadon 3% | 6-8 Kg |
| | Diazinon 10% | 5 Kg |
| | Baseedin 10% | 7 Kg |
| Jassid, White fly, Thrips. | Azodron 40 % | 500-700 ml |
| | Metasystox 25% | 500-700 ml |
| | Nuvacran 40% | 500-700 ml |
| | Supracide 40% | 500-700 ml |
| | Perfecthion 40% | 300-400 ml |
| | Stinger 40% | 300-400 ml |
| | Systoate 40 EC | 300-400 ml |

## RECOMMENDED PRACTICES FOR COTTON CROP*

**Preparatory Tillage:** The land is ploughed once by using soil inverting plough. Then ordinary cultivator is used 2-3 times followed by planking each time. The land is properly levelled and the field is divided into appropriate plots.

**Seed Bed Preparation:** After "rauni" when the fie. is in "wattar" condition, two ploughings followed by planking are given to the seed bed. After this, the use of "tarphali"/cultivator and one planking is recommended.

**Seed Rate:**

| | | |
|---|---|---|
| American Cotton | : | 10 kgs/acre |
| Desi Cotton | : | 6 kgs/acre |

**Number of Plants/acre**

**American Cotton:**

| | | |
|---|---|---|
| Plant population (Nos.) | : | 18,000 to 20,000 |
| Row to row distance | : | 75 cm |
| Plant to plant distance | : | 30-37 cm |

**Desi Cotton:**

| | | |
|---|---|---|
| Plant population (Nos.) | : | 22,000 to 29,000 |
| Row to row distance | : | 60 cm |
| Plant to plant distance | : | 23-30 cm |

**Recommended Varieties and Time of Sowing:** Recommended varieties of cotton and their sowing time for various zones are given in Tables 18 and 19.

**Method of Sowing:** The sowing is done with the single row cotton drill or "pora". The seed is placed at a depth of 6.5 cm. Before sowing, the seed is delinted with sulphuric acid. For this purpose, put 10 kg of seed in an earth or steel or plastic container and pour one kg of acid slowly. Go on shaking the container so that the seed is soaked with acid. Then wash the seed with water and dry it under shade for sowing.

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**Base on recommendations made by the Government of the Punjab, 1988(d), 1987(h), 1993-94(h1), Khan et al. 1987 and Pakistan Agriculture Research Council.*

**Spacing of Cotton:** The spacing of cotton should be done in two stages. First spacing is recommended when the plants attain the height of 15 cm. The second spacing is recommended when the plants are 30 cm high. After the second spacing, plant to plant distance should be 30-37 cm. in case of the American cotton and 22.5-30.0 cm in case of Desi cotton.

**Eradication of Weeds:** 2-3 hoeings are recommended from time to time between the period of sowing and first irrigation. The plough/ "tharphali"/kasola/spade is used for dry hoeing. For the eradication of weeds, stomp @ 1.5 litres or Dowpon @ 4-5 rams or Cotoron Multi @ 2.5 Litres or Cotoguard @ 1.2 litres per acre is recommended.

**Use of Fertilizers:** Doses of fertilizers along with the time of application are given in Table 20.

**Irrigation:**

- First irrigation is applied after 30 to 45 days of sowing. However, water is applied within 30 days of sowing in case of NIAB 78 variety.
- In case of CIM 70, first irrigation is applied after 25-30 days of planting. Subsequent irrigations are repeated at 12-15 days interval depending upon the weather conditions. Last irrigation is applied at the end of September. Last irrigation to all other varieties is applied in the beginning of October.
- Normally 5-7 irrigations are required for the cotton crop. There should not be shortage of water at the flowering stage.

**Control of Insect-pests:** Name of pests alongwith the name of pesticides for their control are given in Table 21.

**Picking of Cotton:** The picking of cotton should be done after 10 A.M. when the dew disappears. The picked cotton should be stored at a dry place. The interval of picking should be 7 days in case of Desi cotton and 15-20 days in case of American cotton. The cotton sticks should be removed from the field before mid of February.

**Table - 18: Recommended Varieties of Cotton for Various Zones/Districts**

| Name of Zone/District | Area/Tehsil | Recommended Varieties |
|---|---|---|
| Lahore | All Districts | Ravi |
| Kasur | All Districts | Ravi, FH-87, NIAB-78,FH-682. |
| Sheikhupura | a) Sheikhupura Ferozewala Tehsil | Ravi,FH-87, NIAB-78,FH-682 |
| | b) Nankana Tehsil & Sangla Hill | FH-87,NIAB-87, FH-682. |
| Gujrat | a) South West of upper Jhelum canal from the Head works to the Chenab river | FH-87,NIAB-78, FH-682. |
| | b) Remaining distt. | Ravi |
| Gujranwala and Sialkot | All Districts | Ravi |
| Faisalabad, Sargohda, Khushab, Bahakkar | All Districts | FH-87,NIAB-78, FH-682,NIAB-86 |
| Jhang, Toba Tek Singh | All District | FH-87,NIAB-78 NIAB-86,FH-682 |
| Mianwali | a) Teh. Esa Khail | Ravi, FH-87, FH-682,NIAB-86 |
| | b) Remaining distt. | NIAB-78,NIAB-86 FH-87,FH-682, MNH-147 |
| Attock, Rawalpindi, Jhelum, Chakwal | All Districts | Ravi |
| Multan, Vehari, | All Districts | MNH-93,CIM-109, CIM-240,MNH-147 |
| Khanewal, Lodhran | All Districts | MNH-93,CIM-109, CIM-240,MNH-147 BH-36 |

...Continued on next page....

| | | |
|---|---|---|
| Sahiwal | a) Arifwala and Chichawatni | MNH-93,CIM-109, NIAB-78 |
| | b) Remaining distt. | NIAB-78,FH-87, S-12,FH-682, NIAB-86,MNH-93, CIM-109,CIM-240 BH-36 |
| Okara | All District | NIAB-78,FH-87, S-12,MNH-93, FH-682,NIAB-86, CIM-109,CIM-240 BH-36 |
| Bahawalpur | All Districts | MNH-93,S-12, NIAB-78,RH-1, |
| Rahim Yar Khan | All District | CIM-240,BH-36 CIM-109, |
| Bahawalnagar | a) Northern Area of Railway line from Bukhsion Khan to Amroa and to Northern part of Beer distributory | MNH-93,BH-36, NIAB-78,CIM-109 |
| | b) Remaining district | Ravi, Rohi |
| Muzaffargarh | All districts | MNH-93,CIM-109, NIAB-86,CIM-240, MNH-147,S-12, Gohar-87 |
| Leiah | All districts | NIAB-78,FH-87, FH-682,MNH-93 MNH-147. |
| D.G.Khan & Rajanpur | All districts | MNH-93,MNH-147, NIAB-78,S-12, CIM-109, |

**Table - 19: Recommended Time of Cotton Crop Sowing**

| Districts | Time of Sowing |
|---|---|
| Mianwali, Bhakkar | Full month of April |
| Lahore, Narowal, Gujranwala Sialkot | Ist April to mid May |
| Sheikhupura, Gujrat, Kasur | a) 2nd fortnight of April for Desi Cotton<br>b) 1st fortnight of May for American cotton |
| Sargodha, Khushab, Faisalabad, Toba Tek singh, Jhang,Pakpatton, Okara and Sahiwal | 15th of April to the end of May |
| Rawalpindi, Attock, Jhelum Chakwal | Mid of March to mid of April |
| Multan,Vehari,Muzaffargarh D.G. Khan, Rajanpur, Lieah Bahawalpur, Bahawalnagar | Mid of May to end of June Khanewal,Lodhran,<br>a) Full month of April for Desi Cotton<br>b) For American Cotton beginning of May to 1st week of June |
| Rahim Yar Khan | Mid of May to the 3rd week of June |

## Table - 20: Recommended Doses of Chemical Fertilizers for Cotton Crop

| Fertility Status | Kg. of Nutrients/acre | | | Quantity in Bags/Acre | | |
|---|---|---|---|---|---|---|
| | N | P | K | Sowing Time | At First Irrigation | At flowering Stage |
| After wheat, where phosphatic fertilizers not applied | 46 | 23 | 25 | $2_{1/2}$ SSP + 1 SOP | 3/4 Urea | 3/4 Urea |
| | | | | OR | | |
| | | | | 1 DAP + 1 SOP | 3/4 Urea | 3/4 Urea |
| | | | | OR | | |
| | | | | 1 NP + 1 SOP | 1 NP | 1 Urea |
| After wheat, where fertilizers were applied according to recommended doses | 46 | 12 | 25 | 1/2 Urea + $1_{1/4}$ SSP + 1 SOP | 3/4 Urea | 3/4 Urea |
| | | | | OR | | |
| | | | | 1/2 DAP + 1 SOP | 3/4 Urea | 3/4 Urea |
| | | | | OR | | |
| | | | | 1 NP + 1 SOP | 3/4 Urea | 3/4 Urea |
| After Berseem where phosphatic fertilizers were applied according to recommended doses | 34 | 23 | 25 | $2_{1/2}$ SSP + 1/2 Urea + 1 SOP | 1/2 Urea | 1/2 Urea |
| | | | | OR | | |
| | | | | 1 DAP + 1 SOP | 1/2 Urea | 1/2 Urea |
| | | | | OR | | |
| | | | | 1 NP + 1 SOP | 1 NP | 1/2 Urea |
| After Berseem where no phosphatic fertilizers were applied | 34 | 34 | 25 | 4 SOP + 1/2 Urea + 1 SOP | 1/2 Urea | 1/2 Urea |
| | | | | OR | | |
| | | | | $1_{1/2}$ DAP + 1 SOP | 1/2 Urea | 1/2 Urea |
| | | | | OR | | |
| | | | | 1 NP + 1 SSP + 1 SOP | 1 NP | 1/2 Urea |
| After Fallow i.e. no previous rabi crop. | 34 | 23 | 25 | $2_{1/2}$ SSP + 1/2 Urea + 1 SOP | 1/2 Urea | 1/2 Urea |
| | | | | OR | | |
| | | | | 1 DAP + 1 SOP | 1/2 Urea | 1/2 Urea |
| | | | | OR | | |
| | | | | 1 NP + 1 SOP | 1 NP | |

Note:
- DAP = Diammonium phosphate
- SOP = Potassium sulphate
- SSP = Single super phosphate
- NP = Nitrophos
- N = Nitrogen
- P = Phosphorus
- K = Potassium

**Table - 21: Control of Insect/ pests of Cotton Crop**

| Name of Insect | Name of Pesticide | Dose/acre |
|---|---|---|
| Cricket and Grass Hoppers | 1) B.H.C. 12.5% | 225 grams |
| | 2) Dieldrin 20% | 125 ml. |
| | 3) Heptachlor 32% | 125 ml. |
| White fly, Jassid Thrips | 1) Temik 10 G | 5 kg |
| | 2) Thimet 10 G | 5 kg |
| | 3) Solvirex 10 G | 5 kg |
| | 4) Disyston | 5 kg |
| | 5) Cygone 40 E | 300-400 ml. |
| | 6) Perfekthion 40 EC | 300-400 ml. |
| | 7) Rogor 40 EC | 300-400 ml. |
| | 8) Roxion 40 EC | 300-400 ml. |
| | 9) Chemathoate 40 EC | 300-400 ml. |
| | 10) Dimetoxal 40 EC | 300-400 ml. |
| | 11) Systoate 40 EC | 400 ml. |
| | 12) Amerthion 40 EC | 400 ml. |
| | 13) Thiodan 35 EC | 1000-1250 ml |
| | 14) Dimecron 1000 WSC | 200-250 ml. |
| | 15) Malathion 57 EC | 800-1000 ml. |
| | 16) Nexagan 80 EC | 600-700 ml. |
| | 17) Curacron 500 EC | 400-500 ml. |
| | 18) Ofunack 40 EC | 450-600 ml. |
| | 19) Sumithion 50 EC | 500-700 ml. |
| | 20) Folithion 50 EC | 500-750 ml. |
| | 21) Accothion 50 EC | 500-750 ml. |
| | 22) Agrothion 50 EC | 500-750 ml. |
| | 23) Supracide 40 EC | 600-700 ml. |
| | 24) Zolone 35 EC | 750 ml. |
| | 25) Ekalux forte 50 EC | 500 ml. |
| | 26) Primicid 30 ED | 250 ml. |
| | 27) Aetellic 50 EC | 450-600 ml. |
| | 28) Celathion 50 EC | 400-500 ml. |
| | 29) Hosdan 40 EC | 1300-1500 ml |
| | 30) Lorsban 40 EC | 350-450 ml. |
| | 31) Lorsban 50 ULV | 750 ml. |

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| | | |
|---|---|---|
| 32) | Meta systx 25 Ec | 500-700 ml. |
| 33) | Methyl - Parathion 50 | 500-700 ml. |
| 34) | Folidol-M 50 EC | 500-700 ml. |
| 35) | Ameropa 50 EC | 400 ml. |
| 36) | Tamaron 600 SL | 400 ml. |
| 37) | Bidrin 86 WSC | 200-300 ml. |
| 38) | Bidrin 24 WSC | 600 ml. |
| 39) | Carbicron 100 WSC | 200-300 ml. |
| 40) | Dipadrin 85 EC | 250 ml. |
| 41) | Azodrin 40 WSC | 400-500 ml. |
| 42) | Nuvacron 40 WSC | 400-500 ml. |
| 43) | Apadrin 40 WSC | 400 ml. |
| 44) | Pillardin 40 EC | 750 ml. |
| 45) | Mikantop 40 EC | 350 ml. |
| 46) | Nurelle D 50 SEC | 400 ml. |
| 47) | Tombel 32 EC | 800 ml. |
| 48) | Alamos-D 25 EC | 1000 ml. |
| 49) | Advantage 20 EC | 500 ml. |
| 50) | Advantage 15 ED | 250 ml. |
| 51) | Larvin 80 DF | 375 grams |
| 52) | Seven-XLR 43-4EC | 1500 ml. |
| 53) | Methavin 90 SP | 225 ml. |
| 54) | Decis D-D 12.5 + 300 EC | 400 ml. |
| 55) | Fastac 10 EC | 100 ml. |
| 56) | Danitol 205 ULV | 600 ml. |
| 57) | Baythriod 150 SL | 250 ml. |
| 58) | Sherpa SEC | 200-250 ml. |
| 59) | Pay Off 10 EC | 200-250 ml. |
| 60) | Cymbush 3 ED | 250 ml. |
| 61) | Baythroid 525 EC | 400 ml. |
| 62) | Karate 2.5 EC | 325 ml. |
| 63) | Karate 0.8 ULV | 800 ml. |
| 64) | Mavrik 2 E | 175 ml. |
| 65) | Tal Star 10 EC | 250 ml. |
| 66) | Boom 525-BC | 1000ml. |
| 67) | Cropgard.50 + 300EC | 400 ml. |
| 68) | Cypergard 50/250EC | 500 ml. |
| 69) | Padan Technical 95-SP | 300 ml. |
| 70) | Sumicidin Super 0.5 ULV | 250 ml. |
| 71) | Voltage 50-EC | 800 ml. |

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| | | | |
|---|---|---|---|
| Army worm | 1) | Cidial 50 EC | 850 ml. |
| | 2) | Elsan 75 SP | 850 ml. |
| | 3) | Orthene 75 SP | 500-700 gram |
| | 4) | Lannate 90 WSP | 250-300 gram |
| | 5) | Nudrin 90 WSP | 250-300 gram |
| Boll worms: Spotted Boll Worm | 1) | Zolone D.T. 41.ZEC | 2000 ml. |
| | 2) | Solone 35 EC | 750-1000 ml. |
| | 3) | Azodrin 40-WSC | 1000 ml |
| | 4) | Pillardrin 40 EC | 750 ml. |
| | 5) | Celathion 50 EC | 1000 ml. |
| | 6) | Cidial 50 EC | 800 ml. |
| | 7) | Elcan 50 EC | 800 ml. |
| | 8) | Gusathion 20 EC | 1000 ml. |
| | 9) | Hostathion 40 EC | 1000 ml. |
| | 10) | Lorsban 50 ULV | 1000 ml. |
| | 11) | Lorsban 50 ULV | 750 ml. |
| | 12) | Orthene 75 SP | 750 ml. |
| | 13) | Supracide 40 EC | 1000 ml. |
| | 14) | Diapadrin 85 EC | 250 ml. |
| | 15) | Lannate 90 WSP | 250-300 ml. |
| | 16) | Nudrine 90 WSP | 250-300 ml. |
| | 17) | Methavin 90 SP | 225 grams |
| | 18) | Sevin LR 43-4EL | 100-250 gram |
| | 19) | Advantage 20 EC | 1000 ml |
| | 20) | Larvin 80 DF | 375 grams |
| | 21) | Mikan Top 40 EC | 350 grams |
| | 22) | Baythroid TM 525 EC | 400 ml. |
| | 23) | Tombel 32 EL | 800 ml. |
| | 24) | Alamos-D 25 EC | 1000 ml. |
| | 25) | Decis-D 12.5 + 300 EC | 400 ml. |
| | 26) | Nurelle-D 505 EC | 400 ml. |
| | 27) | Arrivo 10 EC | 250 ml. |
| | 28) | Cymbush 10 ED | 250 ml. |
| | 29) | Cymbush 3 ED | 250 ml. |
| | 30) | Ripcord 10 EC | 250 ml. |
| | 31) | Syperkill 10 EC | 250 ml. |
| | 32) | Sherpa SEC | 200-250 ml. |
| | 33) | Nurelle 20 EC | 150-250 ml. |
| | 34) | Nmbush 25 EC | 200-250 ml. |

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| | | | |
|---|---|---|---|
| | 35) | Talcord 25 EC | 200-250 ml. |
| | 36) | Pounec 3.2 WEC | 200-250 ml. |
| | 37) | Decis-D 2.5 EC | 200-250 ml. |
| | 38) | Sumicidin 20 EC | 300-350 ml. |
| | 39) | Finkill 20 EC | 250 ml. |
| | 40) | FAstac 10 EC | 100 ml. |
| | 41) | Danitol 10 EC | 600 ml. |
| | 42) | Danitol 2.5 ULV | 1600 ml. |
| | 43) | Baythroid 050-SL | 250 ml. |
| | 44) | Baythroid 050 EC | 250 ml. |
| | 45) | Pay Off 10 EC | 200-250 ml. |
| | 46) | Karate 2.5 EC | 325 ml. |
| | 47) | Karate 0.8 ULV | 100 ml. |
| | 48) | Bestox 5 EC | 200 ml. |
| | 49) | Mavrik 2 E | 175 ml. |
| | 50) | Polytrin-C 440 EC | 500-600 ml. |
| | 51) | Talstar 10 EC | 250 ml. |
| Mites | 1) | Akar 50 EC | 650-750 ml. |
| | 2) | Ethion 46.5 EC | 800-1000 ml. |
| | 3) | Kelthane 42 EC | 1000-1200 ml |
| | 4) | Omitc 57 EC | 650-750 ml. |
| | 5) | Mitac 20 EC | 1000-1200 ml |
| | 6) | Piictran 50 WP | 125-150 gram |
| | 7) | Neoron 500 EC | 500 ml. |
| | 8) | Talstar 10 EC | 200 ml |
| | 9) | Ata[illegible]oron 5 EC | 400 ml |
| | 10) | Bulldok 10 WDC | 400 ml |
| | 11) | Polytrin-c 200 EC | 250 ml |
| | 12) | Sunmerin 5 EC | 500 ml |
| | 13) | Trelate 3.6 EC | 200-250 ml |
| | 14) | Ustaad 25 EC | 175 ml |

## RECOMMENDED PRACTICES FOR SUGARCANE*

**Varieties:** Following varieties of sugarcane should be grown to get high yield/acre:

- COL 54
- B.L. 4
- Triton
- BF 162
- L 118
- COL 24
- L 16

**Land Preparation:**

Sugarcane needs a deep, well worked and fully pulverized seed bed. If there is hard pan, then the use of chisel plough or sub-soiler is recommended. Six to eight subsequent plough-ings are essential to prepare a good seed bed. However, lighter soils require 3-4 ploughings.

**Seed Rate:**

High seed rate should be used for thick cane varieties as compared to thin and medium cane varieties. Normally 80-100 maunds of stripped cane is recommended per acre. However, for thick varieties like BL-4 and Triton seed rate of 100-120 maunds is sufficient to produce plant population of 50-60 thousand canes per acre.

**Time of Sowing:**

There are two planting times: The Autumn planting is done in September, while the Spring planting is done from 15th February to 15th March in the Punjab.

**Row to Row Distance:**

Normally row to row distance should be three feet, while for thick cane varieties it should be four feet. The furrows should be straight from one side of the field to the other side.

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* *Based on recommendations made by the Government of the Punjab 1987 (f), 1993 (f1 ayyer et al. 1986, and Pakistan Agricultural Research Council.*

**Methods of Sowing:**

There are two methods of sowing i.e. wet method and dry method. In the wet method after the preparation of land, the field is irrigated. The field is prepared again by ploughing when the land comes in "watter" condition. Furrows are made and sets are placed at the appropriate depth. First irrigation is applied upon the seed germination.

In dry method, the field is immediately irrigated after planting. The seed sown in furrows is neither deep nor covered with soil. When the land comes in "watter" condition, the space between the furrows is ploughed, then planking is done in such a way that sets are well covered with soil.

For early planting, wet sowing method gives good germination, while for late planting, dry method of sowing is adopted.

**Fertilizer Application:**

The quantities of NPK recommended are given in Table 22. Besides fertilizers, farm yard manure should be applied at the rate of 8-10 cartloads per acre. All P and K and one half of nitrogen should be applied in furrows at planting time. Rest of the Nitrogen may be applied in one to two doses in the month of May and June.

**Table - 22: Recommended doses of Chemical Fertilizers for Sugarcane Kgs. of Nutrient/acre**

| Fertility Status | Kgs. of Nutrient/acre | | | Quantity (Bags) |
|---|---|---|---|---|
| | N | K | P | |
| Poor Soil | 92 | 46 | 46 | 4 Urea + 2 TSP + 2 SOP or 4 Urea + 5 SSP + 2 SOP or 3¼ Urea + 2 DAP + 2 SOP |
| Normal Soil | 69 | 46 | 46 | 3 Urea + 2 TSP + 2 SOP or 2¼ Urea + 2 DAP + 2 SOP or 3 Urea + 5 SSP + 2 SOP |
| Rich Soil | 46 | 23 | 23 | 2 Urea + 1 TSP + 1 SOP or 2 Urea + 221/2 SSP + 1 SOP or 21/2 Urea + 1 DAP + 1 SOP |

Note TSP = Triple super phosphate
SOP = Potassium sulphate
SSP = Single super phosphate
DAP = Diammonium phosphate

**Irrigation:**

For Spring planting, total water requirements ranges from 64-80 acre inches (1600-2000 mm) split in 16-20 irrigations. For Autumn planting, total water requirement is from 80-100 acre inches (2000-2400 mm) split in 20-25 irrigations. Before "monsoon" water should be applied at 7-10 days interval. During "monsoon" the interval should be 15 days. Irrigation should be stopped 20-25 days before the crop is harvested. Fields should be irrigated in the event of frost.

**Hoeing, Interculture, Weeding and Earthing up:**

Three hoeings are sufficient to obtain a good crop. For hoeing/interculture, spade, kasola, desi plough, tarphali or a tractor driven cultivator is used. For the eradication of weeds, weedicides as given in Table 23 can be used.

Earthing up should be done by the end of June in case of Spring crop and by the beginning of April in case of September planting.

**Table - 23: Recommended Weedicides for the Eradication of Weeds**

| Name of Weeds | Name of Weedicide | Dose/acre |
|---|---|---|
| Deela (Cyperus Rotundus) | Gesapexcombi 80 WP | 1.2-1.4 kg |
| Khabal (Cynodon Dactylon) | Gesapexcombi 80 WP | 1.2-1.4 kg |
| Lali (Convolvulus Arvensis), | 1. Gesapexcombi 500 FW | 2-3 litres |
| Itsit (Trianthema Monogyna), | 2. Dowpon-M 74 WP | 4-5 kg |
| Jungli Chuli (Amarantus Viridis) | 3. DMA-6 | 3 litres |

**Pests and Diseases:**

Sugarcane is a long duration crop and is, therefore, attacked by many insect/ pests, diseases etc. which cause heavy damage to the crop. The important insect/ pests and vertebrates along with their control are given in Table 24. Measures for the control of diseases are given in Table 25.

**Harvesting:**

Harvesting of September plant crop, ratoon crop and early season varieties should start in November. Harvesting of mid season varieties like COL 54, BL 19 and Triton may be done in December and January. Late varieties like L-118 should be harvested from February to April. The cane should be harvested about 2.5 cm. beneath the ground level.

**Table - 24: Control of Sugarcane Insect/Pests**

| Name of Insect/Pests | Name of Pesticide | Dose/acre |
|---|---|---|
| Termite | 1. BHC 12.5% | 2 Kg |
| | 2. Heptachlor 32% | 2 litres |
| | 3. BHC 5% | 5 Kg |
| Top Borer<br>Stem Borer<br>Root Borer | 1. Thiodan 35% | 1000-1250 ml. |
| | 2. Methyl Parathion 50% | 500-75 ml. |
| | 3. Nuvacron/Azordin 40% | 1 litre |
| | 4. Furadon | 15 kg |
| | 5. Sevidol | 10 kg |
| | 6. Folidol 50% | 500-750 ml |
| | 7. Carbicron 10% | 500-750 ml |
| Guradaspur Borer | The affected plant should be cut, then burn or feed them to animals | |
| Pyrilla | 1. Gusathion 20 EC | 1 litre |
| | 2. Melathion 57 EC | 1 litre |
| | 3. Methy Parathion 50 EC | 500-700 ml. |
| | 4. Diazinon 60 EC | 500 ml. |
| | 5. Anthio 25 EC | 500 ml. |
| | 6. Azodrin 40 W SC | 500 ml. |
| | 7. Nuvacron 40% | 500 ml. |
| Mites | 1. Kelthane 42 EC | 1000-1200 ml. |
| | 2. Ethion 46.5 EC | 1000 ml. |
| | 3. Omite 57 EC | 750 ml. |
| Rats | 1. Zinc phosphide | |
| | 2. Detia gas | |
| | 3. Phostoxin | |

**Table - 25: Control of Sugarcane Diseases**

| Name of Diseases | Fungicides | Dose/acre |
|---|---|---|
| Red Rot | Vitavax 75 WP | 250 grams |
| | Dithane M 80 WP | 1 kg |
| | Antracol 80 WP | 1 kg |
| Top Rot & Smut | Benlate 50 WP | 125 grams |

## RECOMMENDED PRACTICES FOR POTATO*

**Land Preparation**: Potatoes can be grown in a wide range of soils but well drained loamy or sandy loam soils, rich in organic manure are best soils for obtaining higher yields. First ploughings should be done with the soil inverting plough. Then farm yard manure at the rate of 12-20 cartloads per acre should be applied. Five to six ploughing are needed to prepare a good seed bed. Clods should be broken by applying "Sohaga" or Harrow.

**Varieties:**

Following are the high yield varieties:

- Desire
- Patrones
- Ultimus
- Multa
- Cardinal
- Wilja
- Diamant
- Ajax
- Spunta
- FB 13-9469

**Planting Time**: There are three main crops

- Autumn crop: Planted from 15th Sept to 15th Oct.
- Spring crop: Planted during January
- Summer crop: This crop is raised in the hills. Planted from the last week of April to end of May

**Seed Rate**: Potato seed should be in good physical condition and should be free from fungal and viral diseases. The seed rate is 1200-1500 kgs. for the Autumn crop and the whole tubers are planted. The rate is 600-750 kgs. for the Spring crop and there should be at least 2-3 eyes in each piece of tuber. The per acre population should vary from 28,000-30,000 per acre.

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* *Based on the Recommendations of Government of Punjab 1989 (I) and Pakistan Agricultural Research Council, 1981.*

**Planting Method:**

For obtaining higher yield, plants should be properly spaced. The optimum distance from row to row should be 75 cm and from plant to plant 18-20 cm. The tuber should be planted at a depth of 6-8 cm. for Spring and 11-12 cm. for Autumn crop. The direction of the ridges should preferably be from East to West for the Spring crop and the tubers be planted on the Northern side of ridges, keeping the eye in upward position so as to provide adequate sun to the emerging crop. The tubers should be planted under proper moisture conditions. The germination of the tubers will start within 15-20 days.

**Fertilizer Application:**

Recommendations about the fertilizer applications are given in Table 26.

**Table - 26: Recommended Doses of Chemical Fertilizers for Potato.**

| Item | Kgs. of Plant Nutrients | | | Quantity in Bags | |
|---|---|---|---|---|---|
| | N | P | K | At the time of Preparation of land | At the time of earthing up |
| Where 15-20 Cartloads of farm yard manure applied | 100 | 40 | 0 | 5 SSP+4 AS or 5 SSP+4 AN or 5 SSP+2 Urea | 4 AS or 4 AN or 2 Urea |
| Where no farm yard manure is applied and potato is grown continuously over longer time | 100 | 40 | 50 | 4 NP+2 SOP or 2 DAP or 2 Urea or 2 DAP+2 AN+ 2 SOP or 2 DAP+ 2 Urea+2 SOP | 4 AS or 4 AN |

Note: DAP = Diammonium phosphate
SOP = Potassium sulphate
SSP = Single super phosphate
NP = Nitrophos
AS = Ammonium sulphate
AN = Ammonium nitrate

**Hoeing and Earthing up:** After the germination of the crop, weeds should be removed by hoeing the crop. After 2-3 hoeings, the second dose of nitrogen

should be applied and earthing up should be done. Weeds should be eradicated by using the following weedicides.

- Stomp @ 2 litres/acre
- Gramaxone one @ 1 litre/acre

**Irrigation:** First irrigation should be given after complete germination. Subsequent light irrigations (5-6 cm) should be given at an interval of 7-10 days. The ridges should not be submerged in water. Irrigation should be completely stopped 10-15 days before harvesting in the case of the Autumn crop and 4-5 days in the case of the Spring crop.

**Control of Diseases:** Name of diseases and their control are given in Table 27.

**Table - 27: Control of Potato Diseases.**

| Name of Diseases | Name of Fungicides | Dose/acre |
|---|---|---|
| Potato leaf Roll virus | a) Thimet | 6-7 kgs. |
| | b) Temik | 6-7 kgs. |
| | c) Disyston | 6-7 kgs |
| Early blight | a) Dithane M 45 | |
| | b) Bordeaux Mixture | |
| Late blight | a) Dithane M 45 | 1 kg |
| | b) Captan | 1 kg |
| Fusarium wilt | Plant disease resistant varieties should be grown | |

**Control of Insect Pests:** Name of pests along with their control are given in Table 28.

**Table - 28: Control of Potato Insect/Pests**

| Name of Pest | Name of Pesticide | Dose/acre |
|---|---|---|
| Jassid | a) Temik | 6-7 kgs. |
| | b) Thimet | 6-7 kgs. |
| | c) Disyston | 6-7 kgs |
| Aphid | a) Temik | 6-7 kgs. |
| | b) Thimet | 6-7 kgs. |
| | c) Disyston | 6-7 kgs |
| | d) Dimecron | 200-250 lit |
| | e) Malathion | 1 litre |
| Cut worm | a) Sevin 10 D | 9 kg |
| | b) Sevin 85 | 1 kg |

**Harvesting:**

The Autumn crop is harvested from the last week of December to the end of January, while the Spring crop is harvested from the last week of April to the end of May. The Spring crop either should be stored in a shady place immediately after harvesting or it should be taken to the cool house for longer storage.

## RECOMMENDED PRACTICES FOR DAIRY FARMING*

**Breeds of Cattle:**

- Sahiwal
- Red Sindhi
- Bhagnari
- Dhanni
- Lohani
- Rojhani
- Cholistani
- Hissar
- Dhargil
- Thari

**Breeds of Buffalo:**

- Nili Ravi
- Khundi

**Sheds**: The site selected for shed should be dry, elevated and well drained with good water supply. For one cow and buffalo 3.5 and 4.00 meter square covered area and 7.0 and 8.0 square meter open paddock is sufficient respectively. For bull/sire 12 square meter covered and 120 meter square open paddock is required.

**Breeding Management**: The maintenance of bull/sire in good condition is essential for better breeding programs. Nutrient supply should be according to body weight and intensity of service. Normally 2-3 kg of 13-15 protein concentrate nutrient should be fed in addition to the liberal supply of good quality roughages.

For better breeding results, the cow/buffalo does not require any additional requirement over and above maintenance and milk production. The nutrient requirements for milk production depends on its milk yield and percentage of milk fat in addition to the maintenance requirements. Cows should be mated to conceive between 60-100 days after calving. Mating on or about 85 days after calving results in a calving of 12 months interval.

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*For the recommended practices see Livestock Production Research Institute, 1989 (e) and Sastry et. al., 1976.

**Management of Pregnant Cows/Buffaloes:** Pregnancy of the female animal must be examined after service. Non-pregnant animals must be served again or culled with minimum necessary delay. Examination of pregnancy improves the breeding efficiency as its helps in detecting infertility and problems connected with it at an early stage.

Nutrients must be provided to a female animal for the growth of fetus during pregnancy. The requirement of these nutrients is negligible in the early and middle stages of pregnancy. However, during the last one-third term of pregnancy, additional nutrients should be provided for the growth of fetus. For milch cow/buffalo, an extra allowance of 0.14 kg Digestible Crude Proteins (DCP) and 0.7 kg Total Digestible Nutrients (TDN) should be fed over and above the requirements of maintenance and milk production. If there is no milk production, the extra allowance should be added to the maintenance requirements. The recommended practice is to feed pregnant animal, one to one and half kilograms extra concentrate mixture during the last 60 days of gestation. The cow/buffalo should gain at least 1/2 kg in body weight every day during the dry period.

**Management of Youngstock:** Since the antibodies are transferred from the mother to the calf through colostrum, therefore, colostrum should be fed for three to five days. Overfeeding must be avoided as it causes calf scours. The calf should be kept on the hungry side than overfed. The calf should be fed according to its weight. They require one kg milk for every 10-12 kg body weight per day.

Youngstock should be provided amino acid in the form of high quality protein and from a mixed source of protein. They require vitamins belonging to the B-complex group. They also require more minerals for growth of bone, muscle and other tissues.

Provision of good quality roughages and concentrates in the diet of calves at an early age will help in early establishment of micro-organisms and the development of functional rumen. After 60 days of age, it is not necessary to feed the milk to the calf. The rate of gain per day should range from 200 to 500 grams.

Milk replacer can also be fed to calves from the 15th days after birth. For each litre of milk 200 gm milk replacer should be fed after mixing in warm water. The composition of milk replacer is given in Table 29 and the feeding schedule of calves fed milk replacer is shown in Table 30.

**Feeding Milking Buffalo:**

Buffalo milk production ranges between 5-10 liters per day. For production of milk, 1 kg concentrate should be fed for every 2 kg of milk produced. For example, a balanced ration for a buffalo weighing 500 kg, producing 10 kg of milk with 7 percent fat content is shown in Table 31.

**Table - 29: Ingredients of Milk Replacer**

| Item | Kg |
|---|---|
| Wheat | 10.0 |
| Fish meal | 12.0 |
| Linseed meal | 40.0 |
| Milk | 13.0 |
| Coconut oil | 7.0 |
| Linseed oil | 3.0 |
| Citric acid | 1.0 |
| Molasses | 10.0 |
| Mineral mixture | 3.0 |
| Butyric acid | 0.3 |
| Antibiotic mixture | 0.3 |
| Rovimix A, $B_2$, $D^3$ | 0.125 |

**Table - 30: Feeding Schedule of Calves Fed Milk Replacer**

| Age (Days) | Body Weight (Kg) | Colostrum | Milk (Kg) | Milk Replacer (gm) |
|---|---|---|---|---|
| 0-5 | | 1/10 of body weight | - | - |
| 6-9 | | | 1/10 of body weight | |
| 10-13 | | | -do- | 50 |
| 14-17 | | | -do- | 100 |
| 18-21 | | | 0.5 | 175 |
| 22-25 | | | 1.0 | 250 |
| 26-29 | | | 1.5 | 325 |
| 30-33 | 35 | | 2.0 | 400 |
| 34-36 | 40 | | 2.5 | 500 |
| | 40 | | 1.5 | 600 |
| | 45 | | 1.5 | 700 |
| | 50 | | 1.0 | 800 |
| | 55 | | 1.0 | 900 |
| | 60 | | 1.0 | 1000 |
| | 75 | | 1.0 | 1000 |

Upto 2 months of age minimum milk to be given = 1.5 kg.
**At 2 months of age milk to be reduced to 1.0 kg**

**Table - 31: Feed requirement for buffalo for milk production**

| Requirements | DM (Kg) | DCP (gm) | TDN (Kg) | ME (Mcal) | CA (gm) | P (gm) |
|---|---|---|---|---|---|---|
| Maintenance | 15.0 | 0.30 | 3.7 | 13.2 | 20 | 15 |
| Production. | - | 0.63 | 4.6 | 15.4 | 33 | 26 |
| Total | 15.0 | 0.93 | 8.3 | 28.6 | 53 | 41 |

DM : Dry Matter
ME : Metabolizable Energy
CA : Calcium
DCP : Digestible Crude Protein
TDN : Total Digestible Nutrients
P : Phosphorus

**Feeding Dry Buffaloes:**

For a buffalo weighing 500 kg, the maintenance requirements are:

- DCP = 0.3 kg
- TDN = 3.7 kg
- Calcium = 20 g
- Phosphorous = 15 g

30 kg of green maize or good quality sorghum can fully meet the requirements.

**Buffalo and Cow Diseases**

Important buffalo diseases along with their treatment is given in Table 32.

**Table - 32: Buffalo Diseases alongwith Treatment**

| Name of Disease | Name of Vaccine | Time of Injection |
|---|---|---|
| Hemorrhagic Septicaemia | Oil adjuvant vaccine | May, June and November, December (two times in a year) |
| Black Quarter | Formol killed vaccine | March, April (once in a year) |
| Anthrax | Spore vaccine | August (once in a year) |
| Rinderpest | | (1st injection at the age of six month and second injection at age of two years) |
| Foot and Mouth | Polyvalent tissue culture vaccine | February, March and September, October (Two times in a year) |

## RECOMMENDED PRACTICES FOR SHEEP*

**Breeds:**

- Lohi
- Bibrik
- Baluchi
- Buchi
- Salt range
- Harnai
- Rakhshuni
- Kachhi
- Balkhi
- Kaghani
- Hashtnagri
- Waziri
- Tiraki
- Damani
- Thal
- Kooka

**Sheds:**

A suitable place should be selected for the construction of shed for the general flock. The shed should be elevated so that the rain water is drained out easily. Preferably the shed should be constructed near the trees so that the animals can rest under their shade during the Summer season. Often the flocks are penned in the open during fair weather and a simple shelter with proper ventilation is constructed with cheap semi-permanent materials for monsoon and Winter. For one ewe one meter square covered space is sufficient. Open paddock should be double than the covered area. For ram and lamb 3.4 and 0.4 meter square covered space is needed respectively.

**Selection of Breeding Flock:**

After the selection of the breed, efforts should be made to purchase the best stock available. Old and weak animals should not be purchased. Animals aging 9 to 18 months should be selected for breeding purpose. The initial cost

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* *For the recommended practices see Gopal Krishnan and Lal, 1985; Sastry and Thomas, 1976.*

of such a flock may be comparatively high than haphazard purchases, but returns to the farmers are higher in the long run.

One ram is sufficient to serve 40 sheep. Breeding ram should be healthy and possesses masculine appearance, sturdy and free from defects.

**Management of Ewes and Rams:**

Rams can be mated at the age of two and half years. In a flock when heat is synchronized in all the ewes, the ram will be exhausted by attempting to mate all the ewes. Therefore, surplus rams should be available for setting the ewes in the flock. Good nutrition especially just before and during the breeding season is essential to the overall health and breeding ability of the ram. The ram should not be allowed to follow the ewes all the year round as this reduces the fertility and results in poor health and high mortality in lambs. Mating should be done during Autumn from 15th September to the end of October. The ram should be kept away from the rest of the flock excepting during mating time. The ram should be allowed to serve the ewes only in the morning and evening. This maintains the vigour of the ram. The feet of both the rams and ewes should be paired and trimmed well before mating. Before the mating season, it is also recommended to clip off the dirty and soiled fleece hanging on the posterior or part of the body of ewes specially breech area to facilitate mating by ram. About two to three weeks, before the onset of the breeding season, nutrition of ewes should be stepped up. This brings ewes into heat earlier in the season, resulting in early lambing. Flushing also results in multiple births in the flock. Good flushing feed for ewes may consist of grass pasture plus 250 grams of grain or 250 grams of wheat bran and 150-200 gram of grain or green fodder at the rate of 10 percent of body weight and 100 gram of oilcack per head per day. Provision of minerals, salts and vitamins will definitely improve flushing.

**Management of Preynant and Lactating Ewes:**

The early and mid pregnancy period is not very critical nutritionally. Extra nutritional requirements is not much and the whole of their needs can be met entirely by grazing. During the last month of pregnancy the fetus grows rapidly in the uterus and the nutritional requirements are high. Lack of enough energy can cause pregnancy diseases or ketosis in ewes. Therefore, molasses or grains should be fed at the rate of 225 gram per head per day. As lambing time approaches or immediately after lambing, the grain allowance should be materially reduced, but good quality dry roughage be fed-free choice. After parturition the ration of the ewes may be gradually increased so that she receives the full ration in six to seven days time.

Ration of lactating ewes must be supplemented to maintain adequate milk production which is necessary for the rapid growth of lambs. If they are provided good pasture, the requirements are more or less met.

**Management of New Born Lamb:**

New born lambs should receive colostrum within 2-3 hours after lambing. The umbilical cord is severed and tincture iodine should be applied at the cut end. Protection against inclement weather and suitable warmth should be provided in Winter. Lambs disowned by their mothers and orphaned lambs may be made to suck the ewes that have lost their lambs. Cow milk can also be fed to orphan lambs after warming the milk to a temperature of 100 F. All the lambs should be weaned when 3 to 3-1/2 months old to enable the ewes to recoup their health before the next tuppling season. Weaned lambs should be castrated when they are three months old.

**Sheep diseases:**

Important sheep diseases and their treatment is given in Table 33.

**Table - 33: Important Sheep Diseases and Treatment**

| Name of Disease | Name of Vaccines | Dose per injection | Time of injection |
|---|---|---|---|
| Sheep pox | Sheep pox vaccine | 0.1 ml. | March, December |
| Foot&mouth | Foot and mouth vaccine | 5.0 ml. | February |
| Anthrax | Anthrax spore vaccine | 0.5 ml. | February or before "Monsoon" |
| Enterotoxaemia | Enterotoxaemia vaccine | 3 ml. (Twice after six weeks) | January, July |
| Pneumonia | Pneumonia vaccine | 5 ml | According to requirement. |

**Shearing:**

Shearing should be normally done twice a year i.e. after the completion of Winter and at the end of the rainy season. When sheep are sheared, the wet dirty wool should be first removed and kept separately. White and black wool from sheep should be kept separately. Since the fleece from yearling sheep is graded higher, therefore, it should be packed separately.

**Management of Milking Doe:**

Milking doe should be provided good quality pasture, fodder hay or silage or tree bases. Concentrate must be fed at the rate of 400 gram per kg of milk produced. With proper feeding and care, a doe will normally come into heat within 100 days of kidding.

**Management of Kids:**

Kids should get colostrum at least for 3 to 5 days. Feed 3 to 5 times in the first week and the frequency should be reduced in the subsequent weeks. Later on they must be provided a kid starting ration to the extent they can eat.

## RECOMMENDED PRACTICES FOR GOAT*

**Breeds:**

- Barbari
- Beetal
- Chapar
- Damani
- Kamori
- Koghani
- Dera Deen Panah
- Teddy

**Sheds:**

The floor space requirements are similar to sheep i.e. for a nanny one meter square, kid 0.4 meter square and for buck 3.4 square covered area is needed.

**Management of Breeding Flock:**

Goat should be bred at the age of 12 months. The buck for stud purposes should be two year old. Bucks can perform 120 to 160 services per year at the rate of 2-3 services per week. Buck should not be allowed to move with the flock. Buch should be fed concentrate at the rate of 0.5 kg per day. Vaccination and deworming should be done periodically.

The doe comes into heat every 21 days. Generally the breeding season is spread all over the year. Two pregnancies should be obtained in a year by providing good feeding and management conditions.

**Management of Pregnant Doe:**

After conception doe will produce less and less milk. Normally after three months, milk production will be negligible. However, if she continues to produce milk, milking should be stopped 6 to 8 weeks before expected kidding. If the fodder is scarce or poor quality, concentrate should be fed at the rate of 0.5 kg of concentrate per head per day at least in the last month of pregnancy.

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* *For the recommended practices see Food and Agricultural Organization of United Nations, 1987; Gopal Krishnan and Lal, 1985; Livestock Production Research Institute, 1989 (a); 1988 (b), Sastry and Thomas, 1976.*

**Management of Milking Doe:** Milking does should be provided good quality pasture, fodder hay or silage or tree bases. Concentrate must be fed at the rate of 400 grams per kg of milk produced. With proper feeding and care, a doe will normally come into heat within 100 days of kidding.

**Management of Kids:** Kids should get colostrum at least for 3 to 5 days. Feed 3 to 5 times in the first week and the frequency should be reduced in the subsequent weeks. Later on they must be provided a kid starting ration to the extent they can eat.

**Table - 34: Common Diseases of Goats and their Treatment**

| Name of Disease | Name of Vaccine | Time of Injection |
|---|---|---|
| Goat pox | Goatpox vaccine | March, December (once in a year) |
| Foot and Mouth | Foot and Mouth vaccine | February, October (Two times in a year) |
| Pleuropneumonia | Pleuropneumonia | October, November (once in a year) |
| Enterotoxaemia vaccine | Enterotoxaemia (two times in a year) | January, July, |

## RECOMMENDED PRACTICES FOR POULTRY

**Breeds:**

**Layers:**

- White leg Horn
- Black Monarcha
- Rhode Island Red
- NEW Hempshire
- Plymouth Rock
- Fayumee
- Golden Buff

**Housing:**

A well-drained sandy soil capable of absorbing moisture of the droppings should be selected for constructing the poultry house. The front of the house should be towards South and length East-West. Optimum floor space and good ventilation should be provided in the poultry house. Floor space requirements per bird for layers are as under:

| Age in weeks | Minimum floor space per bird ($cm^2$) |
|---|---|
| 0-4 | 450 |
| 5-10 | 900 |
| 11-20 | 1350-1800 |
| Layers above 20 weeks | 1800-2250 |

The space requirements for broilers should be provided as under:

| Age in weeks | Floor space/100 bird sq. meter |
|---|---|
| 0-2 | 2.5 |
| 3-6 | 5.0 |
| 7-10 | 10.0 |

*For the recommended practices see Economic Analysis Network, 1987; Gopalkrishnan and Lal, 1985; Khan, et. al., 1989; Livestock Production Research Institute, 1989; Masood, 1983; Shastri and Thomas, 1976.

Area covered with windows and ventilators in the walls should be one-fourth of the flour requirements.

**Quality and Care of Chicks:**

Chicks should be the progeny of healthy parents. Day old chicks should be alert and active without pasty cloaca. Chicks should be free of diseases. Chicks should be purchased only from reputed hatcheries.

The brooder house and equipment should be thoroughly cleaned and disinfected in order to make the house free from disease producing agencies. Old litter and leftover feed from the brooder houses should be removed. Fresh litter material should be smoothly spread and the brooder house should be ready for replacement of chicks at least one week before their arrival. Desired temperature should be maintained at least 24 hours before the place of chicks. Clean and fresh water should be made available to chicks immediately after placement under brooder. During Winter season, chicks should be protected from direct and chilling winds. Chicks of different ages should be kept separate.

**Management of litter:**

Poultry farm should be kept neat and clean. Wet litter is a source of diseases, therefore, bedding should be changed after every 12 weeks.

However, bedding should be shaken up and down on every second day. Mixing of one percent lime in bedding is good hygienic measure.

## Feeding:

Several types of feeds are available. Recommended daily requirements per bird are given in Table 35 and 36.

**Table - 35: Daily Nutrient Requirements per Bird (S.C. White Leghorn Type Bird)**

| | Age in weeks | | | | | Laying hen |
|---|---|---|---|---|---|---|
| | 4 | 8 | 12 | 16 | 20 | |
| Body weight (g) | 275 | 590 | 850 | 1100 | 1300 | 1700 |
| Total daily feed(g) | 35 | 55 | 65 | 70 | 80 | 110 |
| Crude protein (g) | 7.7 | 12.1 | 10.4 | 11.2 | 12.8 | 19.0 |
| Metabolizable energy (kcal) | 93 | 146 | 166 | 178 | 215 | 295 |
| Calcium (g) Available | 0.35 | 0.55 | 0.65 | 0.70 | 2.2 | 3.000 |
| Phosphorus (g) | 0.175 | 0.275 | 0.325 | 0.350 | 0.400 | 0.550 |
| Lysine (g) | 0.350 | 0.550 | 0.455 | 0.490 | 0.560 | 0.560 |
| Methionine (g) | 0.123 | 0.138 | 0.163 | 0.175 | 0.200 | 0.330 |
| Total sulphur amino acid(g) | 0.263 | 0.413 | 0.325 | 0.350 | 0.400 | 0.660 |
| Linoleic acid (g) | 0.350 | 0.550 | 0.650 | 0.700 | 0.800 | 1.100 |
| Manganese (mg) | 1.93 | 3.03 | 3.58 | 3.85 | 4.40 | 6.05 |
| Iodine (mg) | 0.035 | 0.055 | 0.065 | 0.070 | 0.080 | 0.110 |
| Iron (mg) | 0.70 | 1.10 | 1.30 | 1.40 | 1.60 | 2.20 |
| Copper (mg) | 0.070 | 0.110 | 0.130 | 0.140 | 0.160 | 0.220 |
| Salt (as NaC1)(g) | 0.175 | 0.275 | 0.325 | 0.350 | 0.400 | 0.550 |
| Vitamin A (IU) | | | | | | |
| Vitamin D (AOAC) | 140.0 | 220.0 | 260.0 | 280.0 | 640.0 | 880.0 |
| Chick units | 21.0 | 33.0 | 39.0 | 42.0 | 96.0 | 132.0 |

## Table - 36: Daily Nutrient Requirements per Broiler Chick

| | Age in Weeks | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Body weight (g) | 80 | 200 | 375 | 600 | 850 | 1125 | 1425 | 1750 |
| Total daily feed (g) | 12 | 30 | 45 | 60 | 75 | 90 | 105 | 120 |
| Crude protein (g) | 2.64 | 6.60 | 9.90 | 13.20 | 16.50 | 18.80 | 19.95 | 22.80 |
| Metabolizable Energy (kcal) | 35 | 87 | 130 | 174 | 217 | 261 | 315 | 360 |
| Calcium (g) | 0.12 | 0.30 | 0.45 | 0.60 | 0.75 | 0.90 | 1.05 | 1.20 |
| Available Phosphorus(g) | 0.06 | 0.15 | 0.28 | 0.30 | 0.38 | 0.43 | 0.53 | 0.60 |
| Lysine (g) | 0.12 | 0.30 | 0.45 | 0.60 | 0.75 | 0.90 | 1.05 | 1.20 |
| Methionine (g) | 0.04 | 0.105 | 0.158 | 0.210 | 0.262 | 0.315 | 0.370 | 0.420 |
| Total sulphur Amino acids (g) | 0.09 | 0.225 | 0.338 | 0.450 | 0.563 | 0.675 | 0.790 | 0.900 |
| Manganese (mg) | 0.72 | 0.80 | 2.70 | 3.60 | 4.50 | 5.40 | 6.30 | 7.20 |
| Iodine (mg) | 0.012 | 0.30 | 0.045 | 0.060 | 0.075 | 0.090 | 0.105 | 0.120 |
| Iron (mg) | 0.24 | 0.60 | 0.90 | 1.20 | 1.50 | 1.80 | 2.10 | 2.40 |
| Copper (mg) | 0.024 | 0.060 | 0.090 | 0.120 | 0.150 | 0.180 | 0.21 | 0.24 |
| Salt (as NaCl) (g) | 0.06 | 0.15 | 0.23 | 0.30 | 0.38 | 0.45 | 0.53 | 0.60 |
| Vitamin A (IU) | | | | | | | | |
| Vitamin D (AOAC) | 72 | 180 | 270 | 360 | 450 | 540 | 630 | 720 |
| Chick units | 7.2 | 18.2 | 27.0 | 36.0 | 45.0 | 54.0 | 63.0 | 72.0 |
| Thiamine (mg) | 0.024 | 0.060 | 0.090 | 0.120 | 0.150 | 0.180 | 0.21 | 0.24 |
| Riboflavin (mg) | 0.06 | 0.15 | 0.23 | 0.30 | 0.38 | 0.45 | 0.53 | 0.60 |
| Pantothenic acid(mg) | 0.12 | 0.30 | 0.45 | 0.60 | 0.75 | 0.90 | 1.05 | 1.20 |
| Biotin (mg) | 0.001 | 0.003 | 0.005 | 0.006 | 0.008 | 0.009 | 0.011 | 0.012 |
| Vitamin B12 (mg) | 0.096 | 0.240 | 0.360 | 0.480 | 0.600 | 0.720 | 0.840 | 0.960 |
| Alfatocopherol (mg) | 0.24 | 0.60 | 0.0 | 1.20 | 1.50 | 1.80 | 2.10 | 2.40 |
| Choline chloride(mg) | 16.8 | 42.0 | 63.0 | 84.0 | 105.0 | 126.0 | 147.0 | 168.0 |
| Zinc (mg) | 0.60 | 1.50 | 2.25 | 3.00 | 3.75 | 4.50 | 5.25 | 6.00 |

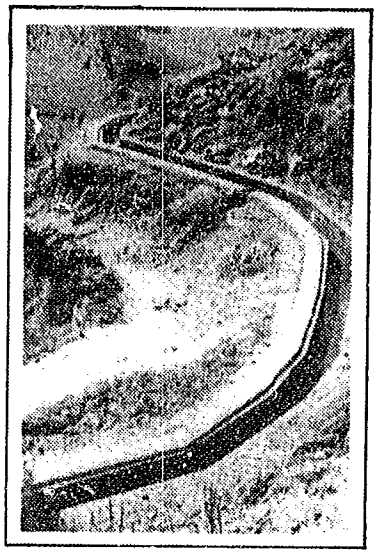
Source: Based on ISI draft standards under circulation cited in Indian Poultry Industry Year Book, 1980.

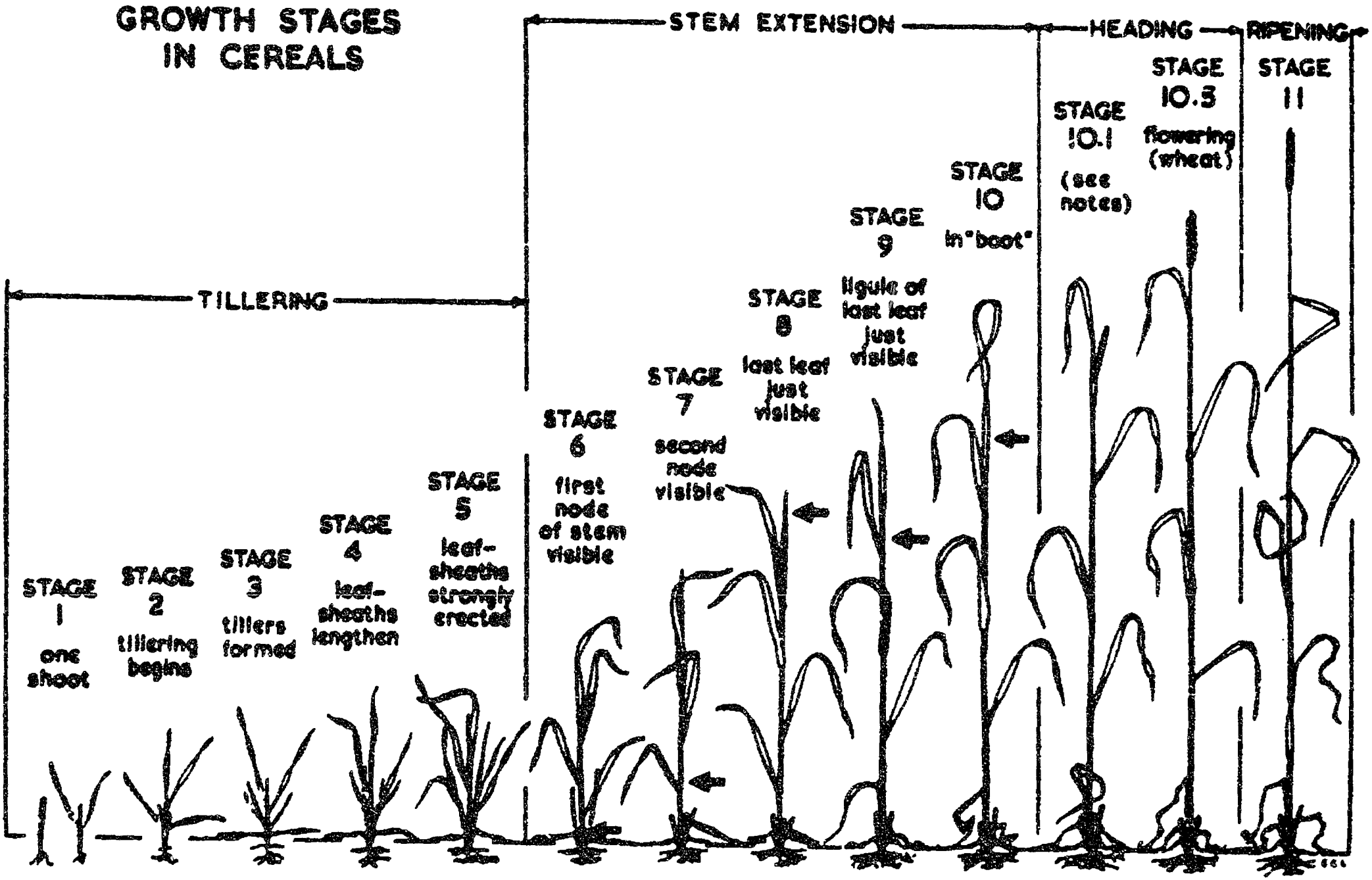
One feeder is required for 35 chicks aging 1-4 weeks, for 25 chicks aging 4-10 weeks and for 20 birds aging 10-20 weeks.

## Table - 37: Vaccination Program for Chicks

| Age | Disease | Vaccine Name | Route | Dose |
|---|---|---|---|---|
| Day old | Marek's | Cell free or cell | Intramuscular | 2 drops |
| 4-5 days | Ranikhet | Ranikhet disease | Intramuscular or Intraocular | 2 drops |
| 4-5 days | Fowl pox | Pigeon pox | Feather follicles | Swab |
| 6-8 weeks | Fowl pox | Chick embrgo | Wing web | 2 pricks |
| 9-12 weeks | Raniket | Ranikhet disease vaccine | Subcutaneous or intramuscular | 0.5 ml. |

# Water Requirements of Crops




GROWTH STAGES IN CEREALS
STEM EXTENSION
HEADING
RIPENING
TILLERING
STAGE 1 one shoot
STAGE 2 tillering begins
STAGE 3 tillers formed
STAGE 4 leaf-sheaths lengthen
STAGE 5 leaf-sheaths strongly erected
STAGE 6 first node of stem visible
STAGE 7 second node visible
STAGE 8 last leaf just visible
STAGE 9 ligule of last leaf just visible
STAGE 10 in "boot"
STAGE 10.1 (see notes)
STAGE 10.5 flowering (wheat)
STAGE 11

## Water Requirements for Various Crops

| Crops | Millimeters | Acre Inches | No. of Irrigation |
|---|---|---|---|
| Lucerne | 2032-2540 | 80-100 | 20-25 |
| Rice | 1626-2032 | 64-80 | 16-20 |
| Sugarcane | 1626-2032 | 64-80 | 16-20 |
| Citrus | 1448-1829 | 57-72 | *19-24 |
| Berseem | 1422-1524 | 56-60 | 14-15 |
| Potato (Autumn) | 1016-1219 | 40-48 | 10-12 |
| Tobacco | 813-1219 | 32-48 | 8-12 |
| Potato (Spring) | 813-1016 | 32-40 | 8-10 |
| Potato (Winter) | 813-1016 | 32-40 | 8-10 |
| Millet | 610-813 | 24-32 | 6-8 |
| Maize | 610-813 | 23-32 | 6-8 |
| Safflower | 610-813 | 24-28 | 6-7 |
| Gram | 508-610 | 20-24 | 5-6 |
| Wheat | 406-508 | 16-20 | 4-5 |
| Cotton | 406-508 | 16-20 | 4-5 |
| Soybean | 406-508 | 16-20 | 4-5 |
| Sunflower | 406-508 | 16-20 | 4-5 |
| Mung | 406-508 | 16-20 | 4-5 |
| Sorghum | 305-406 | 12-16 | 3-4 |
| Toria | 203-305 | 8-12 | 2-3 |
| Raya | 203-305 | 8-12 | 2-3 |
| Sarson | 203-305 | 8-12 | 2-3 |
| Taramira | 203-305 | 8-12 | 2-3 |

* 7.62 Millimeters (3 inches) per irrigation

Source: Mahmood, 1986.

# Nutrient Contents of Food Stuffs

# NUTRIENT CONTENTS OF FEED STUFFS

| Feed Stuff | D.M. | Protein | Fat | C.F. | N.F.B. | Ash | C°O | $P_2O_5$ | $K_2O$ | D.P. | T.D.N. | N.R. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Concentrate** | | | | | | | | | | | | |
| Bajra | 90.0 | 9.8 | 4.6 | - | 72.6 | 3.0 | 0.1 | 0.9 | 0.5 | 4.6 | 54.3 | 10.7 |
| Barley | 91.9 | 9.3 | 2.7 | 6.3 | 71.1 | 2.5 | 0.2 | 0.7 | 0.5 | 6.7 | 70.8 | 9.7 |
| Blood meal | 91.2 | 71.6 | 1.5 | 0.6 | 4.3 | - | 13.1 | 0.6 | 0.5 | .. | .. | .. |
| Blood Meal sterilized | 93.0 | 25.0 | 1.0 | 1.5 | 5.1 | 59.7 | 19.5 | 9.2 | .. | .. | .. | .. |
| Corn | 91.9 | 9.7 | 3.0 | 2.0 | 75.5 | 1.7 | 0.0 | 0.8 | 0.3 | 5.4 | 70.5 | 12.3 |
| Cotton Seed Whole | 93.2 | 14.4 | 17.6 | 21.7 | 34.8 | 4.7 | 0.4 | 1.2 | 1.0 | 8.0 | 73.0 | 8.6 |
| Cotton Seed Desi | 94.8 | 15.4 | 18.9 | 23.2 | 37.3 | .. | .. | .. | .. | .. | 80.9 | .. |
| Cotton Seed Cake | 93.5 | 22.8 | 9.1 | 24.1 | 37.4 | .. | .. | .. | .. | .. | 79.5 | .. |
| Gram | 91.6 | 17.9 | 2.5 | 6.5 | 61.7 | 3.0 | .. | .. | .. | 12.8 | 81.5 | 5.3 |
| Gram Bhoosa | 90.6 | 5.4 | 0.4 | 40.2 | 32.3 | 12.0 | 1.4 | 0.2 | .. | 2.2 | 33.6 | 14.5 |
| Guar | 92.6 | 30.0 | 4.4 | 8.5 | 45.6 | 4.2 | 0.6 | 1.3 | 0.5 | 31.5 | 72.5 | 1.6 |
| Guar meal | 89.3 | 45.9 | .. | 8.9 | .. | 5.2 | .. | .. | .. | .. | .. | .. |
| Groundnut cake | 93.8 | 37.6 | 6.1 | 15.2 | 29.5 | 5.4 | 0.2 | 0.9 | .. | 32.7 | 79.1 | 1.6 |
| Linseed | 94.6 | 18.2 | 34.1 | 6.4 | 30.9 | 5.0 | 0.3 | 1.3 | 1.0 | 14.8 | 108.8 | 6.6 |
| Linseed Cake | 94.4 | 28.9 | 4.2 | 9.1 | 42.8 | 9.4 | 0.6 | 1.6 | 1.3 | 24.9 | 82.6 | 2.6 |
| Meat & Bone Scrap | 93.7 | 49.7 | 10.6 | 2.2 | 3.1 | 28.1 | 10.6 | 5.2 | 7.9 | 40.8 | 65.3 | 0.6 |
| Mustard Cake | 93.0 | 33.9 | 1.0 | 8.1 | 41.6 | 8.4 | .. | .. | .. | .. | .. | .. |
| Moth | 91.4 | 22.6 | 0.8 | .. | 64.8 | 4.2 | 0.3 | 0.7 | 1.0 | 17.4 | 72.3 | 3.2 |
| Molasses | 75.4 | 0 7 | .. | .. | 70.1 | 4.6 | 0.9 | 0.1 | 2.9 | .. | 69.5 | .. |
| Mustard (Sarsoon seed) | 96.4 | 23.3 | 42.0 | 6.0 | 12.6 | 5.1 | 0.6 | 1.6 | .. | 19.8 | 104.5 | 4.5 |
| Mustard Cake | 93.5 | 32.2 | 11.6 | 8.7 | 32.0 | 7.6 | 1.4 | 2.0 | .. | 28.9 | 85.3 | 2.2 |
| Oats Seed | 90.5 | 8.1 | 6.0 | 10.0 | 68.4 | 5.4 | 0.2 | 0.7 | .. | 4.2 | 66.9 | 11.1 |
| Rape Seed Meal (Taramira Cake) | 91.8 | 36.9 | 12.7 | 10.1 | 32.1 | .. | .. | .. | .. | .. | 93.8 | .. |
| Rice Bran | 92.0 | 12.2 | 13.3 | 12.5 | 45.9 | 8.0 | .. | .. | .. | .. | .. | .. |
| **Green Roughages** | | | | | | | | | | | | |
| Alfa (3rd cutting) | 29.4 | 7.4 | 0.7 | 6.6 | 10.2 | 4.5 | 0.6 | 0.2 | 1.3 | .. | .. | .. |
| Bajra Combu Dough | 21.6 | 1.5 | 0.3 | 6.9 | 10.6 | 2.4 | 0.2 | 0.0 | 0.7 | 0.9 | 12.8 | 12.9 |
| Barley (milk stage) | 22.0 | 2.4 | 0.4 | 7.4 | 9.2 | 2.7 | 0.2 | 0.1 | 0.9 | .. | .. | .. |
| Berseem (3rd cutting) | 15.1 | 2.8 | 0.4 | 2.9 | 6.6 | 2.2 | 0.4 | 0.1 | 0.7 | 2.2 | 10.0 | 3.4 |
| Corn (Milk stage) | 20.5 | 1.6 | 0.3 | 5.3 | 11.5 | 1.3 | 0.0 | 0.0 | 0.3 | 1.0 | 14.0 | 13.0 |
| Gram (Milk stage) | 36.8 | 4.4 | 0.7 | 12.5 | 15.0 | 4.2 | 0.9 | 0.2 | 1.3 | .. | .. | .. |
| Juar (Milk stage) | 33.0 | 1.1 | 0.5 | 11.5 | 17.0 | 2.9 | 0.2 | 0.1 | 0.8 | .. | .. | .. |
| Lobia (Dough stage) | 24.1 | 4.4 | 0.9 | 4.8 | 10.5 | 3.5 | 0.7 | 0.2 | 0.7 | .. | .. | .. |
| Moth (Dough stage) | 25.0 | 3.0 | 0.4 | 7.7 | 10.0 | 3.9 | 0.9 | 0.2 | 0.9 | .. | .. | .. |
| Sarsoon (Flowering stage) | 12.9 | 1.4 | 0.4 | 2.6 | 6.1 | 2.4 | 0.5 | 0.1 | 0.3 | .. | .. | .. |
| Senji (Pre flowering stage) | 21.6 | 3.3 | 0.4 | 6.4 | 8.7 | 2.8 | 0.3 | 0.1 | 0.7 | 2.7 | 14.4 | 4.3 |
| Shaftal (3rd cutting) | 14.5 | 3.1 | 0.3 | 2.3 | 6.8 | 1.9 | 0.3 | 0.1 | 0.5 | .. | .. | .. |
| Sugarcane tops | 35.1 | 1.3 | 0.5 | 12.4 | 18.0 | 2.9 | .. | .. | .. | 0.6 | 19.3 | 31.4 |
| Sunflower | 20.9 | 2.5 | 0.7 | 5.0 | 9.5 | 3.2 | .. | .. | .. | 1.8 | 10.2 | 4.7 |
| Sunflower (Pre flowering stage) | 20.9 | 2.5 | 0.7 | 5.0 | 9.5 | 3.2 | 0.5 | 0.1 | 0.8 | 1.8 | 10.7 | 4.8 |
| Wheat (dough stage) | 28.4 | 2.3 | 0.44 | 9.4 | 13.5 | 2.8 | 0.1 | 0.1 | 0.9 | .. | .. | .. |
| Sudan grass | | | | | | | | | | | | |
| (1st cutting) | 35.2 | 1.4 | 0.6 | 11.3 | 18.3 | 3.0 | 0.3 | 0.2 | 0.5 | 0.4 | 17.0 | 41.2 |
| (2nd cutting) | 40.1 | 1.0 | 0.3 | 4.1 | 31.8 | 2.9 | 0.2 | 0.2 | 0.5 | .. | .. | .. |
| (3rd cutting) | 25.3 | 0.9 | 0.3 | 3.8 | 18.0 | 2.3 | 0.2 | 0.2 | 0.2 | .. | .. | .. |
| (4th cutting) | 20.6 | 3.1 | 0.4 | 5.8 | 10.2 | 3.1 | 0.3 | 0.3 | 0.2 | .. | .. | .. |
| (5th cutting) | 19.8 | 1.1 | 0.4 | 5.9 | 9.8 | 2.6 | 0.2 | 0.3 | 0.2 | .. | .. | .. |

.....Continued...

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dry Rocughages** | | | | | | | | | | | | |
| Berseem Leaf Meal | 95.2 | 20.1 | 2.0 | 17.1 | 44.1 | 16.6 | 0.2 | 0.1 | .. | 9.7 | 50.0 | 4.2 |
| Berseem hay | 90.6 | 13.4 | 3.1 | 24.4 | 38.7 | 11.0 | 3.2 | 0.2 | 2.1 | 9.0 | 51.9 | 4.8 |
| Barley hay | 90.8 | 7.3 | 2.0 | 25.4 | 49.3 | 6.8 | 0.2 | 0.2 | 1.3 | 4.0 | 51.9 | 12.0 |
| Barley straw | 90.0 | 3.7 | 1.6 | 37.7 | 41.0 | 6.0 | 0.3 | 0.1 | 1.3 | 0.7 | 42.2 | 59.9 |
| Gray hay (Bhoosa) | 90.6 | 5.4 | 0.4 | 40.2 | 32.3 | 12.0 | 1.4 | 0.2 | .. | 2.1 | 33.6 | 14.5 |
| Gram straw | 86.7 | 6.0 | 0.5 | 44.5 | 35.7 | .. | .. | .. | .. | .. | 37.4 | .. |
| Guar | 83.0 | 16.0 | 1.9 | 22.7 | 42.4 | .. | .. | .. | .. | .. | 49.6 | .. |
| Jowar | 91.3 | 3.4 | 1.4 | 34.8 | 51.6 | .. | .. | .. | .. | .. | 55.3 | .. |
| Maize hay | 90.5 | 5.9 | 0.6 | 26.2 | 46.5 | 11.3 | 0.4 | 0.3 | 0.8 | 2.7 | 50.6 | 17.7 |
| Maize | 91.0 | 7.6 | 1.4 | 25.7 | 56.2 | .. | .. | .. | .. | .. | 68.1 | .. |
| Maize fodder | 91.2 | 6.3 | 1.3 | 28.3 | 45.3 | 10.0 | .. | .. | .. | .. | .. | .. |
| Oats | 89.2 | 9.9 | 2.2 | 26.6 | 50.5 | .. | .. | .. | .. | .. | 69.7 | .. |
| Oats hay | 93.0 | 5.2 | 1.6 | 33.4 | 55.0 | 7.8 | 0.4 | 0.3 | 2.2 | 2.4 | 55.6 | 22.0 |
| Rice straw | 93.9 | 2.8 | 0.3 | 30.9 | 44.5 | 14.9 | .. | .. | .. | .. | .. | .. |
| Senji | 86.9 | 15.3 | 1.7 | 29.4 | 40.5 | .. | .. | .. | .. | .. | 62.0 | .. |
| Sarsoon | 84.4 | 8.8 | 2.8 | 26.6 | 46.2 | .. | .. | .. | .. | .. | 43.8 | .. |
| Sunflower, milk stage | 84.6 | 11.9 | 3.4 | 24.0 | 45.3 | .. | .. | .. | .. | .. | 53.0 | .. |
| Sorghum fodder, Juar | 91.0 | 4.9 | 1.5 | 34.0 | 41.4 | 9.2 | 0.6 | 0.5 | 2.2 | .. | 46.6 | .. |
| Sugarcane leave (katha) | 92.2 | 1.4 | 1.1 | 33.3 | 56.4 | .. | .. | .. | .. | .. | 53.4 | .. |
| Wheat straw | 92.0 | 1.8 | 0.7 | 42.3 | 47.1 | .. | .. | .. | .. | .. | 49.4 | .. |
| Wheat bhoosa | 92.4 | 2.2 | .8 | 38.9 | 40.95 | 9.4 | 0.4 | .. | Neg. | 45.0 | Neg. | |
| **Hay** | | | | | | | | | | | | |
| Dub or dhub grass | 91.3 | 10.1 | 1.3 | 16.8 | 51.7 | 11.4 | 1.0 | 0.5 | 1.9 | 5.5 | 39.2 | 6.1 |
| Jeneva grass hay | 94.4 | 2.8 | 1.2 | 37.0 | 33.3 | 10.1 | 0.5 | 0.1 | 1.0 | .. | 43.9 | .. |
| Jeneva grass hay | 89.3 | 3.0 | 1.2 | 39.2 | 45.9 | .. | .. | .. | .. | .. | 46.1 | .. |
| Musel grass hay | 93.4 | 2.9 | 0.9 | 34.0 | 25.1 | 10.5 | 0.7 | 0.2 | 1.0 | 0.4 | 47.5 | 118.8 |
| Musel grass hay | 88.8 | 3.1 | 0.9 | 36.4 | 48.3 | .. | .. | .. | .. | .. | 47.5 | .. |
| Sudan grass (just past milk stage) | 89.9 | 4.1 | 1.6 | 32.0 | 52.1 | .. | .. | .. | .. | .. | 47.4 | .. |
| Sudan grass hay | 89.1 | 11.2 | 1.5 | 26.1 | 41.3 | 9.5 | 0.4 | 0.2 | .. | 6.3 | 50.0 | 16.9 |
| **Silages** | | | | | | | | | | | | |
| Berseem Silage | 24.0 | 2.3 | 0.6 | 9.6 | 8.3 | 3.2 | .. | .. | .. | 0.7 | 10.3 | 13.0 |
| Guara and wheat bhoosa Silage | 30.5 | 2.3 | 0.7 | 11.2 | 11.2 | 5.1 | .. | .. | .. | 1.0 | 14.1 | 12.6 |
| Juar silage (cut at dough stage) | 34.8 | 1.1 | 0.6 | 10.9 | 18.4 | 3.8 | .. | .. | .. | .. | 18.4 | .. |
| Maize silage (cut at milk stage) | 25.5 | 2.0 | 0.3 | 6.3 | 14.0 | 2.9 | .. | .. | .. | 0.9 | 15.7 | 17.1 |
| Maize silage | 88.7 | 7.9 | 1.1 | 24.6 | 55.1 | .. | .. | .. | .. | .. | 61.4 | .. |
| Oats stage, milk stage | 27.9 | 2.3 | 0.8 | 1.1 | 11.1 | 2.6 | .. | .. | .. | 1.3 | 17.7 | 12.6 |
| Senji silage | 29.8 | 2.1 | 0.5 | 14.1 | 9.4 | 3.7 | .. | .. | .. | 0.6 | 15.1 | 23.4 |

Source: Malik et. al., 1966

# General Farm Management Information

## WATER CHARGES FOR CROPS

| Crop | Rs./acre |
|---|---|
| Wheat | 21.60 |
| Berseem | 13.60 |
| Sugarcane | 64.00 |
| Rice | 56.00 |
| Cotton | 32.00 |
| Toria | 23.20 |
| Lucern | 13.60 |
| Raya | 23.20 |
| Jantar | 21.60 |
| Sorghum | 13.60 |
| Maize | 19.20 |
| Bajra | 19.20 |
| Gram | 16.00 |
| Garden | 50.40 |
| Vegetables | 41.60 |
| Tobacco | 33.60 |
| Musk melon | 28.00 |
| Water melon | 28.00 |
| Alsi | 23.20 |
| Forest | 22.40 |

Source: Patwari Jhang Tehsil

## TYPICAL SOWING AND HARVESTING TIME OF MAJOR CROPS

| Crop | Sowing Time | Harvesting Time |
|---|---|---|
| Wheat | Nov.-Dec. | Mid April-Mid May |
| Rice (Transplanting) | | |
| Irri | 20 May-7th June | Mid Sept.-Beginning Oct. |
| Basmati | Ist June-20th June | End Oct.-Mid Nov. |
| Maize | | |
| Kharif | Mid July-20th Aug. | November |
| Spring | Mid Feb.-Mid March | June |
| Cotton | Mid May-End June | Oct.-Nov. |
| Sugarcane | | |
| Autumn | September | Nov.-Dec. |
| Spring | Mid Feb. - Mid March | Dec.- April |
| Gram | End Sept.-End Oct. | April |
| Lentils | Sept.-Mid November | April |
| Mung | | |
| Spring | Mid Feb. -Mid March | Mid May - Mid June |
| Autumn | August | November |
| Mash | --do-- | --do-- |
| Rapeseed & Mustard | Mid Aug.-Mid Nov. | Mid Dec.-End March |
| Sunflower | Mid Aug.-Mid Sept.<br>Ist Feb.-End Feb. | Mid Nov. - Dec.<br>Mid May-Mid June |
| Safflower | Mid Oct.-Mid Nov. | End April-Ist Week of May |
| Groundnut | March-April(Rainfed)<br>Mid March - End March (Irrigated) | Oct. - Nov. (Rainfed)<br>Mid Aug. (Irrigated) |

| | | |
|---|---|---|
| Potato | | |
| Autumn | Mid Sept.-Mid Oct. | January |
| Spring | Jan.- Feb. | April-May |
| Onions (Transplanting) | January | May-June |
| Tomatoes (Transplanting) | Oct.-Nov. | April-June |
| | February | May-July |
| Water Melon | Mid Feb.-Mid March | May-June |
| Musk Melon | Mid Feb.-Mid March | May-June |
| Berseem | End Sept.-Oct. | Dec.-May |
| Maize Fodder | March | June |
| | Mid July-Mid Sept. | Oct.-Nov. |
| Sorghum Fodder | April-July | June-Oct. |

## Standards for Agricultural Operations

| Nature of work | Standard of work 8 hours/day |
|---|---|
| Ploughing | 1 acre |
| Planking or bar-harrowing | 4 acres |
| Tarphali or Penj Natta | 2.5 to 3.5 acres |
| Automatic rabi drill (sowing) | 3 - 3.5 acres |
| Single row cotton drill | 2.0 - 4.0 acres |
| Sowing of sugarcane sets | 1 acre |

(Tractor cultivation)

| Nature of Work | Area | Time |
|---|---|---|
| Ploughing by tiller | 1 acre | 30 minutes |
| Deep ploughing or disc Hal | 1 acre | 2 hours |
| Disc harrow | 1 acre | 30 to 50 minutes |
| Drill | 1 acre | 25 minutes |

Source: "Zari Diary"

(Manual operation)

| Operations | Unit | Time |
|---|---|---|
| Kera or pora | 1 acre | 8 hour |
| Cutting of sugarcane | 750 to 925 kg | 1 hour |
| Sugarcane stripping | 100 kg | 1 hour |
| Cleaning of water course | 150 feet | 1 hour |
| Hoeing with spade or bahoola | 5 marla | 1 hour |
| Hoeing with khurpa | 2.5 marla | 1 hour |
| Harvesting of wheat | 1 acre | 5 man days |
| Hoeing of sugarcane before germination | 2 kanals | 8 hour |
| Chaffing fodder Thin | 100 kg | 1 hour |
| Thick | 320 kg | 1 hour |

Source: Department of Agriculture, "Zari" Diary, 1977.

## RATIO OF BY-PRODUCT YIELD TO MAIN-PRODUCT YIELD

| Crop | By-product | Main Product | Ratio |
|---|---|---|---|
| Wheat - semi-dwarf | bhusa | grain | 2:1 |
| Wheat - tall local | bhusa | grain | 2.5:1 |
| Atta | bran etc | atta | 1:9 |
| Cotton | seed | lint | 2:1 |
| Rice - Basmati-370 | straw | paddy | 2:1 |
| Rice - Basmati-385 | straw | paddy | 1.5:1 |
| Rice - IRRI | straw | paddy | 1:1 |
| Rice | husks | grain | 2:1 |
| Sugarcane | tops | cane | 1:4 |
| Sugarcane - milled | crushings | raw sugar | 12:1 |
| Sugarcane - gur | crushings | gur | 20:1 |
| Maize | dry stalks | grain | 1.5:1 |

## Retail Prices of Pesticides, Weedicides and Fungicides
## June 1 , 1993

| Item | Price (Rs.) |
|---|---|
| Azodrin 40 WSC | 280 per litre |
| Althio 25 EC | 200 per litre |
| Asomido 60 SC | 350 per litre |
| Apadrin 40 WSC | 275 per litre |
| Arrivo 10 EC | 580 per litre |
| Asocarbo | 320 per bag (8 kg.) |
| Agtoxin | 60 per tube (30 tablets) |
| Baythrid TM | 720 per litre |
| Bactril M | 330 per litre |
| Basudin | 280 per litre |
| Benlate | 900 per kg. |
| Copper Oxychloride | 150 per kg. |
| Danital | 555 per litre |
| Decis D | 648 per litre |
| Deltaphos | 660 per litre |
| Dithane M 45 | 141 per kg. |
| Decis | 760 per litre |
| Dimecron 100 EC | 425 per litre |
| Diazinan | 288 per bag |
| Dicuran MA | 350 per kg. |
| Edmitol | 520 per litre |
| Furadan | 315 per bag |
| Gesapex | 360 per kg. |
| Graminon | 272 per bottle |
| Hepeachlor | 290 per litre |
| Karate | 617 per litre |
| Kelthane | 175 per litre |

| | |
|---|---|
| Lucky | 540 per litre |
| Lazer | 261 per litre |
| Monitor | 350 per litre |
| Magnan | 544 per litre |
| Metasystox | 310 per litre |
| Machete | 229 per litre |
| Nuvacron | 285 per kg. |
| Nogos | 282 per litre |
| Padan | 315 per kg. |
| Pilarphos | 330 per litre |
| Perfekthion | 260 per litre |
| Polytrin-C | 555 per litre |
| PolyramCombi | 605 per litre |
| Ronstar | 230 per litre |
| Ripcard | 560 per litre |
| Systovit | 260 per litre |
| Sherpa | 325 per litre |
| Sundaphos | 340 per litre |
| Stinger | 248 per litre |
| Sundachlor | 220 per litre |
| Summiciden | 725 per litre |
| Sunfuran | 204 per kg. |
| Sevidol | 300 per bag |
| Thiodan | 260 per litre |
| Tamaron | 390 per litre |

*Source: Retail Shop, Faisalabad.

## Government Subsidized Hiring Rates of Buldozer

| Type | Full Rate (Rs.) | Subsidized Rate (Rs.) | |
|---|---|---|---|
| | | CC Area (Rs.) | Barani Area (Rs.) |
| Komatsu D 40 | 173 | 135 | 106 |
| Komatsu D 50 | 205 | 154 | 120 |
| Fiat | 186 | 130 | 102 |
| Cat. D-4 | 173 | 135 | 106 |

## Government Subsidized Drilling Plants Rates

| Size | Rate (Rs.) | |
|---|---|---|
| | Full | Subsidized |
| 7" | 17 | 5 |
| 8" | 18 | 8 |
| 10" | 22 | 11 |
| 12" | 39 | 21 |
| 14" | 46 | 24 |
| 16" | 53 | 27 |
| 18" | 56 | 30 |
| 8" - 10" | 80 | 30 |
| 12" - 15" | 110 | 44 |
| 16" - 18" | 151 | 66 |
| 19" - 20" | 211 | 130 |
| 21" - 24" | 290 | 186 |

Source: Department of Agricultural Engineering, Faisalabad

**Subsidy on Tubewells**

| Area | Diesel Tubewells Subsidized Scheme (Rs.) |
|---|---|
| Barani | 48,000 |
| Salaba | 40,000 |
| Canal commanded | 32,000 |

Source: Government of Pakistan, 1991-92 (b).

# Local Calendar, English Calendar and Matching Days of Calendar Year

| Local Calendar | Gregorian Calendar | Day of Calendar Year |
|---|---|---|
| 18 Poh | 01 January | 1 |
| 30 Poh | 13 January | 13 |
| 01 Magh | 14 January | 14 |
| 18 Magh | 31 January | 31 |
| 19 Magh | 01 February | 32 |
| 29 Magh | 11 February | 42 |
| 01 Phagan | 12 February | 43 |
| 17 Phagan | 28 February | 59 |
| 18 Phagan | 01 March | 60 |
| 30 Phagan | 13 March | 72 |
| 01 Chet | 14 March | 73 |
| 18 Chet | 31 March | 90 |
| 19 Chet | 01 April | 91 |
| 30 Chet | 12 April | 102 |
| 01 Baisakh | 13 April | 103 |
| 18 Baisakh | 30 April | 102 |
| 19 Baisakh | 01 May | 121 |
| 31 Baisakh | 13 May | 133 |
| 01 Jeth | 14 May | 134 |
| 18 Jeth | 31 May | 151 |
| 19 Jeth | 01 June | 152 |
| 32 Jeth | 14 June | 165 |
| 01 Asarh | 15 June | 166 |
| 16 Asarh | 30 June | 181 |
| 17 Asarh | 01 July | 182 |
| 31 Asarh | 15 July | 196 |
| 01 Sawan | 16 July | 197 |
| 16 Sawan | 31 July | 212 |
| 17 Sawan | 01 August | 213 |
| 31 Sawan | 15 August | 227 |
| 01 Bhadon | 16 August | 228 |
| 16 Bhadon | 31 August | 243 |
| 17 Bhadon | 01 September | 244 |
| 32 Bhadon | 16 September | 259 |
| 01 Asuj | 17 September | 260 |
| 14 Asuj | 30 September | 273 |
| 15 Asuj | 01 October | 274 |
| 30 Asuj | 16 October | 289 |
| 01 Katak | 17 October | 290 |
| 15 Katak | 31 October | 304 |
| 16 Katak | 01 November | 305 |
| 30 Katak | 15 November | 319 |
| 01 Maghar | 16 November | 320 |
| 15 Maghar | 30 November | 334 |
| 29 Maghar | 14 December | 348 |
| 01 Poh | 15 December | 349 |
| 17 Poh | 31 December | 365 |

**Fertilizers:**

Use the following percentages to convert weight of commercial fertilizers to their nutrient equivalents (nitrogen:phosphate:potash):

| | $N:P_2O_5:K_2O$ |
|---|---|
| Single Super Phosphate | 18:0:0 |
| Triple Super Phosphate | 52:0:0 |
| NitroPhos | 23:23:0 |
| Urea | 0:46:0 |
| Di-Ammonium Phosphate | 18:46:0 |
| Ammonium Nitrate | 0:26:0 |
| Ammonium Sulphate | 0:21:0 |
| NPK | 10:20:20 |
| SOP | 0:0:50 |

**Animal Units:**

To construct an index of livestock numbers on a Pakistani farm, or group of farms, the following animal units may be used:

| Animal Type | Animal Units |
|---|---|
| Milking buffalo | 1.5 |
| Dry buffalo | 1.2 |
| Young buffalo | 0.6 |
| Milking Cow | 1.0 |
| Dry Cow | 0.8 |
| Young Cattle | 0.4 |
| Bullock | 1.0 |
| Working bullock | 1.2 |
| Goats | 0.25 |
| She | 0.25 |
| Donkey | 0.5 |
| Horse | 1.0 |
| Camel | 1.5 |

The formula is:

Total Animal Units = 1.5 x number of milking buffaloes
+ 1.2 x number of dry buffaloes
+ 0.6 x number of young buffaloes
etc.

## Index of Cropping Intensity

To construct an index of cropping intensity (CI):

$CI_{rabi}$ = 100 x area grown to crops during the rabi season/total cultivated area, including fallow

$CI_{kharif}$ = 100 x area grown to crops during the kharif season/total cultivated area, including fallow

$CI_{overall} := CI_{rabi} + CI_{kharif}$

Note: Annual crops, such as sugarcane, imply an annual index of cropping intensity of 200.

## Average Age of Animals

To construct the average age of a herd or flock of animals ($age_{avge}$):

$$age_{avge} = \Sigma\ age_i \,.\, n_i / n$$

where:

$age_i$ = age of the ith age group of animals

$n_i$ = number of animals in the ith age group

$n$ = total number of animals

## Average Age of Crop Varieties

To construct the average age of varieties in use in farmers' fields:

$$age_{avge} = \Sigma\ age_i \,.\, a_i / a$$

where:

$age_i$ = age of the ith variety

$a_i$ = area of variety i in farmers' fields

$a$ = total area of all varieties of the crop

# LOCAL AND METRIC CONVERSION FACTORS

## Numbers

One lakh = 100,000 One crore = 10,000,000
One arab = 1,000,000,000 100 paisa = 1 rupee

## Weights

| | | | | |
|---|---|---|---|---|
| One kilogram (kg) | = 2.2047 lbs | = 1000 gm | = 0.001 ton (t) | |
| One maund (md) | = 40 kg | = 1/25 t | | |
| One katcha maund | = 37.324 kg | | | |
| One seer | = 2.057 lbs | = 0.9331 kg | | |
| One hundred weight (cwt) | = 112 lb | = 50.8011 kg | | |
| One ton | = 2204.7 lbs | = 1000 kg | = 25 maunds | |
| One long ton | = 2240 lbs | = 1.0160 tons | | |
| One cotton bale (375 lbs) | = 170.09 kg | = 4.25 maunds | | |
| One bag wheat (100 kg) | = 220.47 lbs | = 3.6745 60 lb bushels | | |

## Length

| | | | |
|---|---|---|---|
| One centimeter (cm) | = 0.3937 inches (in) | = 10 millimeters (mm) | |
| One meter (m) | = 100 cm | = 3.281 feet (ft) | = 1.0936 yards |
| One Kilometer (km) | = 1000 m | = 0.6124 miles | = 1093.6 yards |

## Area

| | | | |
|---|---|---|---|
| One hectare (ha) | = 10,000 sq m ($m^2$) | = 2.4711 ac | = 100 m x 100 m |
| One sq. kilometer | = 100 ha | = 1000 m x 1000 m | |
| One square meter | = 0.0001 ha | | |
| 20 kanals (k) | = 1 ha | = 4840 sq yard | |
| 8 kanals | = 1 ac | | |
| 20 marla | = 1 kanal | = 24.2 sq yard | |

## Yield

1 t/ha = 10.117 md/ac = 10.84 "katcha" md/ac = 10 quintal/ha = 4.047 bags/ac
= 14.871 60 lb bu/ac

## Volume

| | | | | |
|---|---|---|---|---|
| One litre (l) | = 1/4.5461 gallons | = 1/3.7853 U.S. gallons | | |
| One litre water | = 1 kg (approx) | | | |
| One litre milk | = 1 kg | = 1.76 pints (approx) | | |
| One barrel oil | = 134.16 kg | | | |
| One million acre feet | = 123.4 mm height of water per ha | | | |
| One inch rainfall | = 25.4 mm | | | |
| One cusec ($ft^3$/sec) | = 448.83 galls./min. | = 2040.4 l/min. | = 0.99 ac in/hr | |

## Local Terms

| | |
|---|---|
| andda | egg |
| arthi | local commission agents in markets |
| bakhar | wooden desi harrows, normally bullock drawn |
| bakra/bakri | male goat/female goat |
| barani | rainfed areas |
| basmati | high-quality long-grained aromatic rice |
| beopari | local merchant |
| berseem | Egyptian clover |
| bhadh | ewe |
| bhusa | wheat straw, after threshing |
| chapati | flat unleavened bread |
| charpoy | local beds, often also used to form stacks of bhusa |
| chattra | male lamb |
| chawal | dehusked rice |
| chusa | chick |
| dal | lentils or any pulses |
| desi | local, indigenous or traditional |
| desi hal | traditional bullock-drawn plough |
| dofasla-dosala | two crops in two years, usually with one year of consecutive fallow |
| dosh | milk |
| dumbicity | phalaris minor, a major grassy weed in wheat |

| | |
|---|---|
| dubari | land growing a rabi crop on residual moisture, usually after rice |
| gai | cow |
| gadda | bullock drawn cart |
| gandam | wheat |
| ghee | fat, typically from animal fats, but there can also be vegetable ghee |
| godown | grain storage |
| gram | chickpeas |
| guntaka | wooden desi harrows, normally bullock drawn |
| gur | locally-prepared raw sugar |
| hal | plough |
| jowar | sorghum used for fodder |
| kalar | black sodic and saline soils |
| kamad | fresh sugarcane |
| kammees | artisans or laborers from landless households |
| kapas | seed cotton |
| karaha | flat bullock-drawn blade for making bunds and land levelling |
| kasola | small chipping hoe |
| katcha | general term for poor to average quality of soil/land |
| kera | dropping seed by hand into furrows created by a plough, later covered by planking |
| kharif | the season extending from late-Spring to Autumn (including main summer crops) |
| khuddar | mera land which is eroded |

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| khurpi | small hand-held sickle-shaped hoe |
| kokri | laying her |
| lepara | land regularly manured, usually near the village |
| lohar | village blacksmith |
| maj/bhanis | buffalo |
| mang/maangi | exchanging of labor for harvest |
| mandi | local market place |
| mangi | exchange laborers |
| mera | land not regularly manured, usually away from the village |
| monsoon | season during which monsoon winds blow from South, characterized by heavy kharif rains |
| mung | kharif legume, mung beans |
| munshi | hired farm manager |
| nan | flat bread, slightly leavened |
| nullah | ditch or deep creekbed |
| numbardar | village headman who collects revenue and is the normal village spokesman |
| paddy | unhusked rice |
| patwari | person who maintains crop records of each farmer |
| rahat | persian well, for underground water extraction by an animal-driven water lift (chains & buckets are common) |
| pora | sowing into furrows with a funnel and tube attached to a plough |
| porah | mera land which is eroded |

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| pothwar | rainfed plateau of Punjab, extending from the Salt Range to the Indus River |
| pukka | general term for good quality |
| raab | repeated ploughing and planking of land to break down clods and prepare for crops |
| rabi | the season extending from mid-Autumn to late-Spring (including main winter crops) |
| raja hal | deep plough |
| rauni | irrigating land after harvest, to start land preparation for the following crop |
| rot kohi | land in which natural floodir g (or artificial flooding) is the main source of moisture |
| roti | bread in the general sense |
| sadabahar | sorghum x sudan grass hybrid fodder |
| sanda/saan | sire bulls, buffaloes/cows respectively |
| sarsown | a type of mustard eaten as a vegetable |
| seeling | ploughing of maize and other similar crops about 3-4 weeks after emergence to thin, aerate and kill weeds |
| seyp | traditional system in which a land-owner claims the services of artisans and laborers in exchange for in-kind payments and favours |
| shaftal | Persian clover |
| sohaga | planking with log, either bullock or tractor drawn |
| tanda | maize stalks |
| tar wattar | soil in relatively wet condition |
| tarphali | three-tyned bullock drawn implement for interculture |

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| tehsil | a sub-district |
| tubewell | well for underground water extraction via tubes or pipes, electric or diesel powered |
| union council | a subset of a tehsil |
| vangar | exchanging of labor for harvest |
| wad wattar | irrigating a standing crop soon before harvest for land preparation for the following crop |
| wattar | condition of the irrigated soil so that it is sufficiently dry to plough |
| zamindar | the farmer who owns the land |

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